HAWAII MEDICAL JOURNAL

Volume 2
Number 5

MAY-JUNE, 1943

$2.00 per yr.
35c per copy

Published Bi-monthly by
THE HAWAII TERRITORIAL MEDICAL ASSOCIATION
(Incorporated in 1856 under the Monarchy)

Mabel L. Smyth Memorial Building
510 S. Beretania St.
Honolulu, Hawaii, U.S.A.

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Acid-Fast Bacilli in the Sputum

D. R. CHISHOLM, M.D.
Kealia, Kauai

This paper has been written with the idea of offering to the interested private physician an opportunity to review the significance of the presence of acid-fast organisms in the sputum. The subjects considered include the clinical value of positive sputum, contamination with acid-fast organisms, the value of the various methods of demonstrating the tubercle bacillus, opportunities for error in the bacteriological diagnosis of tuberculosis, and clinical notes on the associations of acid-fast organisms with positive and negative roentgenograms of the chest.

THE CLINICAL VALUE OF POSITIVE SPUTUM

The discovery of tubercle bacilli in the sputum is of value for the following reasons: (a) It proves tuberculosis is present. (b) It proves that the disease is active. Although one can often state that the disease is active by the roentgenologic appearance of the lungs, the reverse is not true. There are no criteria by which one can diagnose inactivity from a single film, or, in some forms of the disease, from a series of films. Sputum studies will often reveal that a lesion, indiscreetly labelled inactive by the reader of the film, is a plentiful source of tubercle bacilli. (c) It proves that the patient is infectious, and suggests that already he may have infected some of his contacts. (d) The numerical trend of the sputum studies toward positive or negative findings is one of the best guides to the course of the disease and to the treatment indicated.

Appreciation of the significance of the above factors explains why the sanatorium physician is willing to go to any length to prove or disprove the presence of tubercle bacilli in a patient's sputum.

Negative sputum, even persistently negative sputum, does not exclude tuberculosis from the differential diagnosis. The most careful technician may fail to demonstrate bacilli in the late stages of acute exudative tuberculosis even when the roentgenologic appearance of the lesion suggests caseopneumonic disease, or in extensive acinous-productive involvement when two-thirds of the entire pulmonary area may appear to be involved. In such cases, bacilli are probably always present, at least intermittently, even though direct sputum cultures or animal inoculations are negative. This is demonstrated by the frequency with which gastric concentrates will reveal bacilli following animal inoculation.

When bacilli are present in the sputum, failure to find them by routine tests is usually dependent on one or more of four factors, namely, paucity in number, intermittent presence, unsatisfactory sputum specimens, and the personal equation of the technician. A common source of confusion arises when a careless laboratory technician reports an obviously unsatisfactory specimen (saliva) simply as 'negative,' when it should be reported as 'negative—unsatisfactory specimen.' A satisfactory specimen of true sputum from the same patient might be teeming with tubercle bacilli.

A GENERAL NOTE ON CONTAMINATION BY ACID-FAST ORGANISMS

Many saprophytic, acid-fast bacilli are found in nature. The timothy or grass bacillus is the most common of these organisms. Baldwin, at Saranac Lake, has shown that nonpathogenic, acid-fast, soil bacilli may be obtained with ease from washings of fruits and vegetables.[1] As Baldwin suggests, the inference is obvious that such bacilli must frequently be present in saliva, sputum, and gastric washings. They must also be plentiful in dust. They must be, and indeed are, ubiquitous. It is so common to find acid-fast organisms in old distilled water that laboratory workers often refer to *the* distilled water bacillus. Tap-water often contains saprophytic acid-fasts, and such organisms may be obtained in scrapings from the inside of water-faucets.[2]

Mention is made of these saprophytic acid-fasts, and of their ubiquity, to emphasize the fact that the finding of one or two acid-fast bacilli in the sputum on a single occasion is not in itself conclusive evidence of tuberculosis. Nevertheless, and in spite of the abundant opportunity for contamination with nonpathogenic acid-fasts, it is a clinical fact that the presence of acid-fasts in the sputum is nearly always synonymous with the presence of tubercle bacilli in the sputum.

Considering the ubiquity of nonpathagenic acid-fasts, and the facility with which they may enter the respiratory tract via inspired air or ingested food, it becomes a matter of interest as to why they are found with such relative infrequency in the sputum. Baldwin states that nonpathogenic acid-fasts vary between phases of acid-fastness and non-acid-fastness, and suggests that one reason nonpathogenic acid-fasts are not more commonly identified in sputum is that they exist in a non-acid-fast stage in the human body.[1] Corper has shown that tubercle bacilli must be present in sputum to the extent of at

least 100,000 per cubic centimeter before there is even a fair chance of finding them by direct smear under the microscope.[3] The same relative chances must hold for any other organism. It is very likely that saprophytic acid-fasts only rarely occur in sputum in anything like the numbers attained by the tubercle bacillus. In the majority of cases they are present as transients. Then, of course, saprophytes found in some smears may not have come from the sputum at all, merely representing sparse contamination from slides or reagents. All in all, the factor of numbers is probably most responsible for the rarity with which nonpathogenic acid-fasts are found in the sputum by direct smears, or even by concentrates. The fact that nonpathogenic acid-fasts occasionally are found persistently in the sputum does not invalidate the dictum that acid-fasts in the sputum are to be considered tubercle bacilli until proven otherwise.

It is to be noted that the tubercle bacillus itself may be a contaminant in the laboratory. Tubercle bacilli may be present on previously used slides, in centrifuge tubes used for sputum concentration, in common staining baths which are, but should not be, used for bacteriological work, and on oil immersion lenses and glass rods which are often allowed to come in contact with smears.

In laboratories doing sputum concentration work, every now and then a fifty cc. centrifuge tube breaks in the centrifuge. When this happens, and the tube container is not large enough to hold all the fluid, a fine spray of the sputum mixture spreads over the laboratory. If the method being used to liquefy the sputum does not kill the tubercle bacillus, that spray may be full of living organisms. No one who has ever seen this accident happen could have any doubt as to the opportunities for subsequent contamination of slides, glassware, reagents, and laboratory dust. Nor could one doubt the hazard to the laboratory workers under such circumstances. Another source of contamination is the sputtering from a loop being sterilized in a flame. When the sink is used for the disposal of urine, slide washings, centrifuge tube washings, etc., the spattering when the tap is turned on may result in laboratory contamination with dead or viable organisms. Because of the factor of chance, such contamination is largely of theoretical importance in direct smear work, but may be of considerable practical importance in concentration work. It should be of little significance in culture work if sterile technique is used throughout.

THE DIRECT SPUTUM SMEAR

Searching for a specific organism in sputum which contains fewer than 100,000 such organisms to the cubic centimeter is like looking for a needle in a haystack. Failure to find the needle does not mean that it is not there. The significance of this fact is enormous. If a sputum contains, let it be supposed, only 75,000 bacilli per cubic centimeter, that sputum is obviously infectious, and yet it might be declared negative after many direct smear examinations had failed to demonstrate the bacilli.

There is another reason why the direct smear must be interpreted with some caution. When acid-fasts are found in the direct smear, their identification as tubercle bacilli can be made only on morphologic grounds. And there are no constant morphologic differences between the tubercle bacillus and many other acid-fasts.

The value of direct smear examinations varies with the type of sputum being examined, with the number of organisms the sputum contains, and with the experience, carefulness, and patience of the technician. Of the latter, little need be said. In a panel discussion by leading tuberculosis authorities before the Medical Section of the American Trudeau Society, the majority of the experts agreed that a smear should be examined for at least ten minutes before being judged negative.[4] The Committee on Standard Laboratory Procedure of the American Trudeau Society recommends as a minimum standard that approximately five hundred microscopical fields should be examined before a slide may be called negative.[5]

When abundant purulent sputum results from tuberculosis, the tubercle bacillus usually can be found in that sputum with relative ease. It may be accepted as a fairly reliable clinical axiom that when three careful searches in purulent sputum fail to demonstrate the tubercle bacillus, it is unlikely that the sputum is associated with tuberculosis. Definite exceptions to this may be the either independent or consequential association of bronchiectasis with chronic fibrotic tuberculosis.

When sputum is scanty, as it often is, either because little is produced or because the patient swallows most of it, the careful selection a small mucopurulent fleck from the sea of saliva, and its examination by direct smear, may produce immediate positive findings.

Pottenger has demonstrated the importance of making sure that smears are properly stained.[6] Thus, he reports a gain of forty-six per cent in slides diagnosed as positive when the smears are deeply stained as compared with light staining. He also found picric acid to be a definitely superior counterstain in ability to reveal a maximum number of acid-fast organisms.

Weiss describes a new method of staining the tubercle bacillus which makes the organism much easier to demonstrate microscopically.[7] A very intriguing method of demonstrating the tubercle bacillus is that of fluorescence microscopy[8]. In this

procedure the bacilli are stained with a fluorescent dye, illuminated by an appropriate wave-length, and examined under the microscope.

If direct smear findings are open to the slightest question, the physician is charged with the responsibility of studying the sputum by culture or animal inoculation.

CONCENTRATION OF TUBERCLE BACILLI IN THE SPUTUM

Tubercle bacilli in the sputum are enveloped in masses of mucopurulent material which is not soluble in saliva or water. In order to increase or concentrate the number of bacilli per unit volume, they must first be freed from the trap of mucopurulent sputum. This is effected by digesting or dissolving the mucopurulent material in some chemical solution, of which one of the best is a four per cent solution of sodium hydroxide in commercial Clorox, the latter being essentially a five per cent solution of sodium hypochlorite. This mixture, which approximates fifty per cent antiformin, dissolves the mucopurulent material and non-acid-fast organisms within a minute or so. It does not, happily, dissolve the acid-fast tubercle bacillus.

Once freed from enveloping mucopus, the tubercle bacilli may be concentrated by centrifuging or by other physical methods, such as emulsifying the treated sputum with xylol and allowing the bacilli to collect in the xylol cream which rises to the surface. The sputum concentrate is stained by the usual acid-fast method and examined microscopically.

Sputum concentration magnifies all the opportunities which the direct smear possesses for turning out false-positive slides. The xylol flotation method is so sensitive that the technician must be careful not to obtain false-positives by showing up acid-fast organisms, dead or alive, pathogenic or nonpathogenic, which come from improperly cleaned laboratory glassware, especially from slides, centrifuge tubes, or emulsifying tubes that have been used for previous cases. Proper laboratory technique, however, will reduce the chances of obtaining false-positives to a clinically insignificant degree. Such technique presupposes that, before being used, all laboratory glassware is boiled for half an hour in a weak solution of lye and then allowed to soak in the well known bichromate and sulfuric acid cleaning fluid for twenty-four hours. This twenty-four hour soak in acid bichromate solution is a minimum requirement of the Committee on Standard Laboratory Procedure of the American Trudeau Society.[5]

Sputum concentration is a very satisfactory, practical method for revealing the tubercle bacillus and is now the standard, routine procedure in many sanatoria. The value of the concentration test as compared with the direct smear is, of course, obvious. This value will vary with the number of bacilli present, with the degree of concentration attained, and, as in the case of the direct smear, with the technician's conception of proper staining methods and of how many microscope fields should be examined before calling a slide negative. It is impossible to overestimate the importance of this personal factor in the microscopic search for pathogenic organisms.

EXAMINATIONS OF THE FASTING GASTRIC CONTENTS

Many patients with roentgenologic and clinical evidence suggesting tuberculosis are not conscious of raising sputum and it is difficult to obtain satisfactory specimens from them for examination. Such patients are often continuously, although unconsciously, swallowing small amounts of sputum which become 'pooled' in the stomach. Concentration of the fasting gastric contents and subsequent examination by smear, culture, and animal inoculation is an excellent method for demonstrating the tubercle bacillus in a considerable percentage of these cases. Gastric lavage for tubercle bacilli is of particular value in children, who nearly always swallow their sputum.

The value of examining the fasting gastric contents for tubercle bacilli has been firmly established by much careful work, and the procedure is now a routine one in most sanatoria. In a series of one hundred and twenty-three newly admitted tuberculous patients, Roper and Ordway doubled their recovery of tubercle bacilli by adding concentration and animal inoculation of gastric contents to a parallel study by smear and animal inoculation of direct sputum.[10] Other investigators have had even more spectacular results.[11] Through use of this method during the past decade or so, many experienced tuberculosis specialists have had to revise their conception of the relative stability or activity of 'healed' lesions. Negative gastric cultures or guinea pig inoculations offer a much better guarantee of true healing than similar negative examinations of the direct sputum.

Roper and Ordway emphasize the well-known fact that the number of tubercle bacilli in a particular patient's sputum may vary greatly from day to day, or in afternoon specimens as compared with morning specimens, this variability holding true both for direct sputum examinations and gastric washings. The conclusion, as in the case of direct smears, is that repeated gastric lavages should be carried out if the first is negative.

CULTURE OF THE TUBERCLE BACILLUS

Nationally known authorities have done much careful experimental work in order to determine the relative sensitiveness of concentration, culture, and

animal inoculation methods for demonstrating the tubercle bacillus[12]. Results vary with the techniques used. In general it may be stated that the best cultural methods hold an unquestioned superiority over the best concentration methods and are only questionably inferior to animal inoculation. This does not provide an argument for dispensing with animal inoculation. Culture and animal inoculation complement each other in the elimination of inherent deficiencies in the separate methods.

Artificial culture offers an extremely sensitive means of detecting the tubercle bacillus in pathological material. This statement is subject to a condition, however. It holds true only if modern, technically perfect culture media are used, if meticulous care is taken to prevent contamination, and if care is taken in identifying the organism grown.

In recent years there have been great advances made in media for culturing the tubercle bacillus. The media recommended by the Committee on Standard Laboratory Procedure of the American Trudeau Society are Loewenstein's medium as modified by Jensen and Holmes, or as modified by Petrik, and Petragnani's medium as modified by Saenz[5]. Corper criticizes the employment of these complex media for diagnostic culture work, and shows that his simpler egg-yolk medium is equally efficient[15]. It cannot be too greatly emphasized that the success of the culture method will vary tremendously with the degree of adherence to technical details in preparing the media. Some of these details have been recently reviewed by Corper and Cohn[15].

Falsely negative cultures may result from (a) the use of unsuitable culture media—important, (b) too thick a layer of inoculum on the medium, thereby excluding oxygen from the bacilli—important, (c) overtreating the specimen with chemicals used to destroy contaminating organisms, (d) failure to neutralize the material for inoculation following treatment for concentration or contamination, (e) failure to inoculate several tubes, (f) failure to incubate long enough, or (g) prolonged exposure of the material to light prior to attempts at culture.

Falsely positive cultures may be reported as the result of one of two errors, viz: (a) Contamination of the culture tube with tubercle bacilli from a source other than the specimen being examined. (b) Contamination of the culture tube with a nonpathogenic acid-fast which is mistaken for the tubercle bacillus. This group would also include cases of mistaken identity involving such organisms as the smegma bacillus and acid-fast diphtheroids actually present in the specimen being cultured.

In a laboratory where much examination of tuberculous sputum, urine, etc., is being done, occasionaly contamination of cultures is inevitable unless certain precautions are taken. This is particularly so when the sputum, urine, etc., to be cultured is first concentrated in unsterile glassware previously used for identical purposes. It should be remembered that the tubercle bacillus is difficult to kill by chemical means. Thus, ten to fifteen per cent sulfuric acid will not kill the tubercle bacillus or destroy its ability to grow in culture even after half an hour's contact in an emulsion with sputum.

In this connection it is only fair to state that false-positive contaminations with the tubercle bacillus are not necessarily the fault of the laboratory. The contamination may have come from an unsterilized sputum bottle, from an unsterilized urinal, or from the twenty-four hour specimen bottle in which the urine was collected. (For an excellent discussion of the survival and viability of the tubercle bacillus outside of the human body the reader is invited to study the article on the subject by C. Richard Smith.[16]). Likewise, the physician should not hastily condemn, because of a negative roentgenogram, the laboratory finding of a positive sputum culture. The laboratory findings may be accurate and correct, as will be seen presently when this matter is discussed more fully.

The sensitivity of the guinea pig inoculation test is often emphasized by the statement that only a very few bacilli (one or two, according to some authorities) are sufficient to cause tuberculous disease. It is equally true that a single viable bacillus is capable of developing into a gross culture, a fact which makes evident the significance of meticulously avoiding contamination in culture work.

The experienced and careful laboratory worker will seldom if ever mistake a saprophytic acid-fast culture for a culture of the tubercle bacillus. Rate of growth and cultural morphology are usually distinctive. Macroscopic growth appearing before twelve days should make the technician suspect that he is not dealing with the tubercle bacillus. Growth of the latter organism usually becomes apparent between the seventeenth and thirtieth days. All cultures should be examined microscopically for acid-fast bacilli. Macroscopic growths of tubercle bacilli are not easily emulsified, a property which helps to distinguish tubercle bacilli from other acid-fasts. Growth of an acid-fast organism at room temperature serves to distinguish it as nonpathogenic.

Acid-fasts obtained from atypical macroscopic growths, and which are microscopically typical of tubercle bacilli, often are not tubercle bacilli[17]. They may be smegma bacilli, an organism which sometimes fairly closely resembles the tubercle bacillus both microscopically and in cultural characteristics[18]. Whenever there is the slightest suspicion as to the identity of an acid-fast organism obtained by culture, a guinea pig inoculation with the culture should be made. The laboratory worker who is not

critical of variations in the appearance of macroscopic growths, who interprets his cultures without microscopic confirmation, and whose suspicions are not easily aroused by atypical staining and morphology of acid-fast organisms, will inevitably make occasional false-positive diagnoses.

Pappenheim's stain is not entirely satisfactory as a means of differentiating between the smegma bacillus and the tubercle bacillus. Bent and West describe a method of differentiating between these two organisms by growing them on Petragnani's or Petroff's medium containing malachite green or some other triphenylmethane dye[19]. The smegma bacillus causes decolorization of the dye. The tubercle bacillus causes no decolorization.

The human, bovine, and avian types of the tubercle bacillus can be readily differentiated by cultural characteristics and reaction of animals to inoculation. Bovine bacilli will kill a rabbit in two to five weeks. Human bacilli produce a mild disease in the rabbit, death being delayed for six months or longer. Guinea pigs are very susceptible to the human and bovine bacilli, but very resistant to the avian bacillus.

ANIMAL INOCULATION

Guinea pig inoculation is probably the surest means of detecting or ruling out the presence of the tubercle bacillus in pathological materials. If bacilli are present, their detection is almost a certainty. Some culture enthusiasts, not without an abundance of supporting evidence, will deny this alleged superiority of animal inoculation.

The great advantage of the animal inoculation method is that it not only discovers bacilli when present but identifies them beyond question through the development of tuberculous disease. The two disadvantages of the animal inoculation method are the time required for tuberculosis to develop in the animal, and the cost.

Except when the guinea pig shows evidence of tuberculosis, the safest rule is to keep the animal for three months before killing and examining it. It is a common practice, however, to kill and autopsy the animal at six weeks. Caseous enlargement of the lymph glands draining the inoculation point in the groin is the usual evidence sought. If the pig is killed early, the glands may be enlarged but not caseous. The spleen or liver may show tubercles. Diagnosis should not be considered unequivocally positive until smears are made. When the guinea pig has been injected with an atypical culture, histologic sections may be advisable. False-negatives are possible if the animal is killed too soon, or if the bacilli were killed by overtreatment with the chemicals used to destroy contaminating organisms. False-positives are possible from unsterile sputum bottles, unsterile centrifuge tubes, etc.

NEGATIVE CHEST X-RAY ASSOCIATED WITH NON-PATHOGENIC, ACID-FAST ORGANISMS IN THE SPUTUM

Occasionally the physician is confronted with the problem of a negative chest film but the presence of acid-fast organisms in the sputum. The question immediately arises as to whether these organisms are pathogenic or nonpathogenic.

The possibility of sputum being contaminated with acid-fasts from water, soil, and food has already been noted. At least two cases are reported in the literature in which nonpathogenic acid-fasts were repeatedly present in the sputum of patients who had cardiospasm and pulmonary induration, the latter resulting, presumably, from aspirotion of food[20].

The smegma bacillus has been identified fairly frequently in the sputum of bronchiectasis. One can well imagine with what ease this bawdy organism might adjust its unrefined tastes to such an environment.

When leprosy bacilli are present in the nose, they may also be found in the sputum, especially if concentrates are done. In Hawaii this possibility must always be remembered.

The most common saprophytic organisms inhabiting the nose and nasopharynx are those constituting the group known as the diphtheroid bacilli. These diphtheroids may sometimes develop varying degrees of acid-fastness, and, as may be surmised from the following case reports, might be mistaken for tubercle bacilli.

CASE 1. R. K., No. 8829, a Hawaiian woman, aged 74, was admitted to the Leahi Hospital on Oct. 17, 1939, with a diagnosis of pulmonary tuberculosis based on chronic cough, questionable roentgenologic evidence, and the finding of acid-fast bacilli in the sputum by smear on several occasions. The patient was found to have arteriosclerosis, hypertensive cardiac enlargement, and positive Wassermann and Kahn reactions. Roentgenograms of the chest showed only slight accentuation of the perihilar markings, a change interpreted as probably of cardiac origin. Sputum examinations revealed a considerable number of acid-fast bacilli in almost every specimen. They closely resembled tubercle bacilli, but further studies by cultures (three) and guinea pig inoculation (one) were negative. Nasal scrapings revealed acid-fast organisms similar to those obtained in the sputum. Consultation with the medical staff of Kalihi Hospital failed to reveal clinical evidence of leprosy. The organism was studied extensively in the Leahi Hospital laboratory and in the Kalihi Hospital laboratory and was finally interpreted as being a weakly acid-fast diphtheriod. The patient was discharged as having no tuberculosis.

CASE 2. C. D. H., No. 7092, a Chinese man, aged 55, was admitted to the Leahi Hospital on May 9, 1934, on the basis of positive sputum. The chief

complaints were headache, weakness, foul breath, and excessive salivation. Roentgenograms of the lungs were essentially negative. Several direct sputum smears revealed acid-fast bacilli. Four cultures and one guinea pig inoculation failed to demonstrate the tubercle bacillus. Subsequently, nasal swab and throat swab smears were found to contain the same organism. The specific identity of the organism was not determined. As in the previous case, it was quite likely a diphtheroid. Skin snips and clinical examination for leprosy were negative.

It might be pointed out here that failure to secure a culture of an acid-fast organism which is known to be present in a specimen is in itself good evidence that the organism is not the tubercle bacillus. Saprophytic acid-fasts are more readily killed by the chemicals used to destroy contaminating organisms in the specimen before culture inoculation is made.

Positive Chest X-ray Associated with Non-pathogenic, Acid-Fast Organisms in the Sputum

CASE 3. A. K. H., No. 7673, a Hawaiian woman, aged 53, was admitted to the Leahi Hospital on Feb. 21, 1936. This patient was a contact to her daughter, who had far-advanced pulmonary tuberculosis. Her only complaint was of a productive cough. Physical findings consisted of low-grade fever, atrophic rhinitis, chronic suppurative sinus disease, and coarse bubbling rales over the lower two-thirds of both lungs. The chest film showed bilateral basal infiltrations suggesting bronchiectasis. The sputum was abundant and mucopurulent.

On two occasions smears showed large numbers of acid-fast organisms in the sputum. The remaining examinations, a total of sixty, failed to reveal any acid-fasts. Concentrates and one guinea pig inoculation were also negative. A diagnosis of bronchiectasis was made and it was felt that the organisms obtained in the two positive specimens were not tubercle bacilli. Scrapings from the nose revealed similar organisms. Consultation with the Kalihi Hospital staff revealed no clinical evidence of leprosy. Further study of the organism at both the Leahi Hospital and Kalihi Hospital proved that it was not the tubercle bacillus, the final opinion being that it was a diphtheroid.

CASE 4. A. M. H., a Caucasian-Hawaiian man, aged 49, was admitted to the Leahi Hospital on Oct. 23, 1937. He subsequently died of bronchogenic carcinoma. During the patient's stay in the hospital, and in the course of a large number (forty) of sputum examinations, acid-fast organisms were found on two occasions. Four cultures and one guinea pig inoculation were negative for tubercle bacilli.

CASE 5. U. N., No. 5167, a Japanese woman, aged 36, was admitted to the Leahi Hospital on Dec. 28, 1928. Her chest films, plus persistent findings of acid-fast bacilli by smear in the sputum, led to a confident diagnosis of tuberculosis. This patient died following an operation. Post mortem examination revealed that no tuberculosis was present, but that the pathologic findings in the roentgenograms were due to the presence of a dermoid cyst filled with yellowish, cheesy material interspersed with light-colored hair. The yellowish material in the dermoid was found to consist of masses of acid-fast bacilli. These organisms were not tubercle bacilli, but their specific identity was not established. Presumably the dermoid cyst communicated with a bronchus, although such a finding is not noted in the record.

Negative Chest X-ray Associated with Tubercle Bacilli in the Sputum

All in all, cases such as the above are relatively rare. Acid-fasts in the sputum nearly always turn out to be true tubercle bacilli. This having been proved by cultures or guinea pig inoculation, it is evident that a tuberculous lesion must be present in spite of a negative x-ray. Under these circumstances, the lesion nearly always consists of either a caseous hilar gland which has ulcerated into a bronchus, or of a cavity in the subapical portion of a lower lobe[21].

Caseous hilar glands are much more common than caseous cervical glands. The broncho-pulmonary and tracheo-bronchial lymph glands lie immediately in contact with the walls of the air passages. It is thus not surprising that caseous hilar glands occasionally ulcerate into a bronchus. When this happens, a positive sputum results.

Ulceration of hilar glands has, of course, been seen at autopsy by many pathologists, and the diagnosis may often be surmised clinically. I have seen the syndrome in three cases under observation for hilar gland enlargement, though the majority of cases are probably not recognized clinically. Because of the age incidence of primary tuberculous infection, the syndrome is much more common in infants and small children.

Rupture of a caseous gland into a bronchus commonly results in the more or less abrupt onset of cough, expectoration, and positive sputum. Occasionally, evacuation of a caseous gland into a bronchus gives rise to acute dyspnea and suffocation. Often the episode is quickly followed by rapidly progressing pulmonary tuberculosis if the aspiration is massive, or, if the seeding is not too heavy and the resistance high, by an acute exudative lesion in the lung, one form of the clinical hodgepodge known as 'epituberculosis.' The onset of symptoms may be more gradual if the fistulous communication is of small size, as is probably so in the majority of cases. The complaints may then be of obstinate, not too productive cough, and may suggest that diagnosis of which the physician should always be wary, especially in youngsters, primary chronic bronchitis.

When caseous glands are completely evacuated into the air passages over a short period of time, a highly positive sputum may exist during the period of evacuation. It may then suddenly become much more difficult to find tubercle bacilli in the sputum.

Rapid evacuation of the glands is due to the fact that liquefaction of the caseous material usually precedes the rupture. Liquefied caseous material characteristically teems with bacilli. Following evacuation of this material, the number of bacilli in the sputum sharply drops. However, the abscess cavity of the gland persists for variable lengths of time and will continue to expel tubercle bacilli in diminishing numbers. These are ideal cases for recovering the tubercle bacillus by gastric lavage.

The subapical portion of each lower lobe lies directly behind the hilum in that portion of the lung which rests in the so-called costovertebral gutter. At this subapical level, especially in short or fat subjects, the border of the mediastinal shadow in the x-ray lies considerably lateral to the vertebral column. This means that an appreciable volume of the subapical portion of each lower lobe lies behind, and is obscured by, the mediastinal shadow. (It is to be noted that the apices of the lower lobes lie considerably more caudad in the average postero-anterior roentgenogram than one might imagine from application of descriptive anatomy.) Most cavities in the lower lobes are found in the subapical region. Such cavities may be invisible in postero-anterior films and the remainder of the lung field may be clear. A film taken in the oblique position will clearly reveal such a cavity. Whenever a patient, especially an adult, has a positive sputum with a negative postero-anterior plate, oblique plates, preceded by fluoroscopy for optimum positioning, should always be taken.

Very occasionally a positive sputum with negative x-ray findings will be associated with tracheobronchial tuberculosis. It is to be suspected that a good many, if not all, of these cases are secondary to ulceration of caseous glands into the bronchi.

Rarely, a positive sputum is due to tuberculous ulceration of the nasal septum, adenoid tissue, tonsil, pharynx, or tongue. Usually, however, these ulcerations have such definitely localizing symptoms that they seldom give rise to difficulty in diagnosis.

Trudeau and Yeager's report would seem to indicate a very favorable prognosis for patients with positive sputum but negative x-ray findings[22]. However, in seventy-five of the one hundred such cases which these authors followed, the diagnosis of positive sputum was based on a single finding. Granting that the majority of the acid-fasts found in Trudeau and Yeager's series may have been tubercle bacilli, the same favorable prognosis cannot be allowed for those patients with negative x-rays, in whom a positive sputum is repeatedly found. In these cases the early development of a parenchymal lesion is common[21]. Such cases should be followed very closely. Failure of a lesion to develop should arouse suspicion that one is not dealing with the tubercle bacillus.

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Note: The writer extends his thanks to Dr. H. H. Walker for permission to report cases from the records of the Leahi Hospital, and to Mr. M. F. Shinn, Laboratory Technician at the Leahi Hospital, for his suggestions on technical matters.

Bacillus Tuberculosis---Views Regarding the Diagnostic and Prognostic Importance of Its Presence in the Sputum *

Prologue

D. W. CHISHOLM, M. D.

To understand the first few paragraphs of Dr. Otto Fennel's paper it is important to note that at the time it was written, 1884, Koch's tubercle bacillus had been known for but two years, and that the great Virchow had eighteen years yet to live. The following quotation from the first edition of Osler's *Principles and Practice of Medicine* will explain why the pathology of tuberculosis, or consumption, or phthisis, was a subject for controversy in some minds even two years after the tubercle bacillus had been discovered. Osler states (1892): "Only a great master like Virchow could have won the profession from a belief in the *unity of phthisis*, which the genius of Laennec had, on anatomical grounds, announced. Here and there a teacher, as Wilson Fox, protested, but the heresy prevailed, and we repeated the striking aphorism of Niemeyer, 'The greatest evil which can happen to a consumptive is that he should become tuberculous.' It was thought that the products of any simple inflammation might become caseous and that ordinary catarrhal pneumonia terminated in phthisis. It was peculiarly fitting that from Germany, in which the dualistic heresy arose, the truthof Laennec's views should receive incontestable proof, in the demonstration by Koch of the etiological unity of all the various processes known as tuberculous and scrofulous."

Goettingen, July 29, 1884

EDITORS LANCET AND CLINIC:

Can it not now be accepted as an established fact in the general pathology of phthisis pulmonalis, that all forms of this disease are of tubercular origin? All recent investigations and researches in this field certainly seem to me to establish more and more the truth of this statement. The original distinction of Virchow, separating the caseous pneumonia and caseous bronchitis from the true tubercular form of phthisis, must still be partially upheld on account of descriptive anatomical reasons; nevertheless, this division of processes must be abandoned, not only from existing histological relations, but more especially from an etiological and practical point of view. A careful microscopic examination already showed a similar histological character of the elements in both the forms of caseous pneumonia and bronchitis as in the so-called true tubercle. In all forms of phthisis, even in the non-apparent tubercular varieties, we always find the characteristic submiliary, non-vascular nodules with giant cells which are typical of the fully developed tubercle.

These formerly unknown charateristics of morbid anatomy of phthisical lung have certainly at present much limited Virchow's views of duality of phthisis; the everyday occurrence, for instance, of tubercular pleuritis complicating a case of caseous pneumonia could not any longer be explained as the onset of a new disease (as Virchow and followers taught), but was solely to be explained as an extension of the same morbid process existing in the lungs to its investing membrane. It seems strange that this simple and self-evident explanation of the process, compared with the former views, was so long in becoming established,—yet such was the case.

Several years later Charcot and his school then claim from original and similar observations to have discovered the "unite de la phthisis," and Rindfleisch, in his article upon the subject, arrived at similar conclusions. Finally, Cohnheim and others in still later years in their experimental investigations showed the inoculabilty of the tubercular virus, and then Koch's great epoch-making discoveries proved beyond the peradventure of a doubt that phthisis and tuberculosis had a common etiological factor and only in very exceptional cases do other causes complicate the morbid change.

Pulmonary consumption must therefore be considered to be in by far the majority of cases a local tuberculosis of the lungs. Consequently, if we find those parasites (which we know to produce tuber-

* Fennel, Otto W.: Foreign Correspondence, The Cincinnati Lancet and Clinic 52:285 (Sept. 13) 1884.

culosis) in the sputum, we must draw the conclusion that a tubercular process is taking place somewhere in the respiratory apparatus (including mucous membrane of mouth and throat). But must we likewise infer that a general tuberculosis will of necessity result sooner or later and the case prove to be a literally hopeless one? No, that would indeed be a grave mistake, for the bacillus is not only found in those cases of tuberculosis in which the process is spreading more or less rapidly, and, eventually, by entering blood and lymph channels, is extended over the entire organism, but likewise in those less severe cases in which it has for years and tens of years been latent (even finally entirely disappeared) [and] in those varieties known as "localized tuberculosis."

In this respect the human organism seems to differ materially from that of the lower animals (experiments upon rabbits and guinea-pigs proving that inoculation, for instance, in the anterior chamber of the eye, with the tubercular virus produces tubercular deposits in the bulbs and general infection rapidly following, the animal perishing from its effects), while in man it is a settled pathological derivation that the process may run for a long period a relatively benign course and even terminate in the disappearance of the original tubercular deposits.[1] It is true that as long as the nidus remains there is always danger of a sudden increase of intensity of process and without any cause that we may determine [it may] take(s) on a sudden local or general extension. The human body, however, appears in the majority of cases to be only a tolerably fertile soil for the bacillus, so that they multiply but sparingly, but if under certain (to us yet unknown) conditions there takes place a rapid development of the parasites there follows necessarily a rapid extension of the process. At present we do not as yet possess a knowledge of those pathological conditions which in many cases retard the development of the germ; could we but create them we would have established the greatest advance in modern therapeutics, viz.: the successful treatment of tuberculosis,. and although we have at the present time not solved this great problem, the paths to its successful attainment have already been partially opened and we may hope that this high aim will be reached by the continued diligent labor of the investigators in the near future.[2]

Now, when we find the bacillus in the sputum, we at once prove that a tuberculous process exists, which perhaps may by rapidly extending local destruction and conveyance to other organs become eminently dangerous to life, but again which may run a very slow bland course, the original deposit even undergoing secondary degeneration and disappearance.

The diagnosis of pulmonary consumption, verified by presence of the bacilli, is now often made, when formerly only a doubtful one was possible. The bacilli are found on the surface of every, even the smallest, phthisical cavern, on tubercular defects of the bronchi, etc., in large numbers. They are found much more easily and readily in the sputum than the elastic fibres, by means of which only heretofore destructive processes in the lungs were ascered, because of their well-marked properties of taking up certain coloring agents, by means of which they are at once brought into prominent view possessing their characteristic outlines and isolated colors. We can, therefore, by a careful examination of the sputa, recognize those numerous lighter cases of phthisis which terminate favorably and were formerly diagnosed as "suspicious" pulmonary catarrhs, bronchitis, etc., indeed even those cases which exhibit only slight subjective symptoms. And we see best from the dissecting table how eminently numerous are these cases of phthisis with a favorable termination.

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[1] In the light of present-day knowledge of the pathogenesis of tuberculosis, it is evident that in this paragraph Otto Fennel is failing to distinguish between primary tuberculous infection in animals and secondary or reinfection tuberculosis in man. Primary inoculation (infection) in man follows the same course as primary inoculation in animals, i.e., it is followed within a matter of hours by a tubercle bacillus bacillemia which continues, probably intermittently, for a variable number of days until such time as the reaction of a developing allergy localizes the organisms. The end result of this primary hematogenous dissemination varies with the specific host. In man the dissemination only occasionally results in either immediate or late progressive disease. Such metastatic foci as are set up are abortive. In the guinea pig this primary dissemination nearly always leads to fatal generalized tuberculosis.—D.W.C.

[2] Otto Fennel would perhaps be greatly surprised could he know that even today we have no specific measures for the treatment of tuberculosis. It is true that we have learned of the tremendous importance of variable individual allergy in response to the tubercle bacillus. We know that allergy has much to do with the type of tuberculous pathology (exudation, caseation, productive, or mixed reaction) manifested by any one individual. However, about the only therapeutic lesson we draw from this knowledge is in the line of prevention: Avoid progressive disease in the highly allergic, primarily infected individual (commonly an infant or small child) by preventing frequent reinfection by removing that individual from the source of infection—commonly a parent.

The relationship between allergy and immunity in tuberculosis is still controversial. Until we know more about this relationship, and much more about the individual factors of allergy and immunity, we are at a loss to adequately explain individual and racial variations in resistance to the tubercle bacillus. —D.W.C.

In apparently healthy, strong individuals, adults, who have met their death suddenly from some accident, acute disease, etc., we find by a more searching investigation in almost half of all cases the signs and remains of a phthiscal destructive process in the lungs, and that in the form of cheesy, often calcareous, incrusted masses, with cavity formation, surrounded by indurated cicatricial tissue. Now many of these cases have run their course perfectly latent, at least the majority of them have never caused the slightest suspicion of a pulmonary affection; but, again, in each and every one, the bacillus tuberculosis could have been proved to have been present at a certain time.

However, that from these cases, to outward appearances terminating favorably and the process involving but a small area, there can suddenly develop a tubercular pleuritis, indeed a fatal tubercular meningitis, etc., is well known to all experienced physicians and is only too often proved by clinical practice and subsequent autopsies.

Having detected presence of the bacilli in the sputum we are always forced therefore to make a grave but not of necessity fatal prognosis. For it is a well known fact, that even rapidly spreading phthisical destruction in the lungs under favorable circumstances may come to a halt and that not every case of phthisis incipiens must cause great destruction of pulmonary tissue. The detection of the bacilla [*sic*] in the sputum is of especial and increased value in diagnosing tubercular affection from the fact that they are already found in the early state of the disease when other signs and symptoms are not well marked; (we find this to be the case in our clinics and poli-clinics [*sic*] here at Goettingen from carefull observation) of great importance I wish to add, as in the treatment everything depends upon the diagnosis and consequent steps being taken in the earliest stages of the disease when the lives of many patients can be saved by combating its future ravages by the only means we as yet possess that is proper regimen, hygienic surroundings, mode of living, climate influences, etc.[3] The relation between the quantity of bacilli in the sputum to the severity of the pathological process has not yet been definitely determined to any degree of certainty.

But on the other hand the constant absence of the tubercle-bacillus in the sputa may be assumed as a certain proof that tubercular-phthisical destructive changes are not then occurring in the pulmonary organs. If elastic fibres are found in the sputum, and no bacilli, we are forced to conclude that other destructive processes such as degeneration of tumors, opening of abscesses, etc., are going on in the lungs.

We must not forget to mention, however, that certain chronic ulcerative processes occur in the lungs that are not of tubercular origin and consequently no bacilli are found, these cases are very exceptional and embrace those diabetic sloughing processes of the pulmonary parenchyma first described by Reigle; but in the majority of the diabetic phthisis cases abundant bacilli are found. The pathological change resembles very much, in those cases in which the bacili are absent, that occurring in the ordinary form tubercular phthisis.

In the examination of the sputa for bacillus-tuberculosis, it ought to be understood that only the best methods, those that give the most accurate results, should be employed. It is quite true that they can be discovered in some speciments with low magnifying glasses, indeed if they are very numerous, they can occasionally at once be recognized with the naked eye itself by their power of taking up certain colors but in spite of these known facts it would be a great mistake to use any but the very best immersion lenses in bacillus-tuberculosis researches, as it is quite a common occurrence and we often have had the experience here in the laboratories, that the bacilli present in the specimen prepared for the microscope are not found in the field by means of the weaker lenses (viz. dry lenses) yes, entirely overlooked, but are at once clearly visible when higher magnifying lenses (lowest we use is 600) are employed instead. It is at least quite impossible to form a definite negative opinion in regard to the bacillus tuberculosis without the use of the best immersion system of lenses, above all the oil-immersion and Abbe's apparatus so highly recommended by Koch. He who fears the expense of these most necessary auxilliary [*sic*] means and the increased amount of more accurate labor should at once withdraw from the field of schizomycete investigation, as without them his derived results will be of comparatively little value and of very doubtful significance.

The manner in which we find and color bacilli rapidly and obtain the best results and specimens is a modification of the Koch-Ehrlich-Orth method, and may be given as follows:

1. Spreading out ot the sputum on a black painted plate and picking from this an opaque whitish or grayish white particle by means of two platinum

[3] How true this latter statment is even today. There are few cases of minimal tuberculosis that cannot be cured by "proper regimen, hygienic surroundings, mode of living." The treatment of more advanced cases by collapse measures, as pneumothorax, phrenic nerve paralysis, pneumoperitoneum, and thoracoplasty, has been a major therapeutic step but obviously merely a mechanical method of applying more effectively the rest implied in Otto Fennel's "proper regimen." D.W.C.

needles (brought to a glowing heat just before using).

2. Spreading or rather rubbing up of the particle between two, (resp. more,) cover glasses of 13-18 m.m. thickness so that a thin, even layer is obtained about as thin as required in blood examinations. The cover glasses are not to be lifted but rubbed apart.

3. Then the cover-glass is carried through a spirit lamp three or four times and about as rapidly as the knife is moved in the act of cutting bread.

4. A few minutes shaking up of aniline oil with distilled water in about the proportion of 5-100, then filtered through a moistured filter into a porcelain dish (aniline water).

5. Addition to above solution of a filtered oversaturated one of gentian violet in 90° alcohol, until a well marked opalescence occurs and then thoroughly stirring mixture with glass rod (for every 10 c.c.m. of aniline water about 15 drops of the gentian violet coloring solution are required).

6. Now we either allow the prepared cover glasses to swim on the surface of this solution for twenty-four hours (if longer no harm is done) or we place the porcelain dish with the swimming glasses (I usually make six specimens from one sputum) on a triangle covered with a wire net over a spirit lamp and continue to heat until small, bursting bubbles from on the surface of the fluid or speaking more accurately and thermometrically up to 80° c. and then let them stand for a few minutes.

7. Removal from the liquid and prepared as follows: having removed the coverglass with a small forceps, we absorb the now unnecessary coloring solution from the surface by means of blotting paper and dip it into a solution of Hydro-chloric alcohol (100 c.c.m. alcohol, 20 c.c.m. distilled water and 20 drops concentrated Hydrochloric acid) allowing it to remain about a half minute. Now, we pass it through 90° pure alcohol until even the faintest trace of the blue color has disappeared (1-2 minutes) and wash it off with distilled water.

8. Whereupon the coverglass is placed prepared side upwards and allowed to dry, which is hastened by blowing through glass tube. Finally by means of an eye-dropper 4-5 drops of a concentrated watery solution of vesuvian are dropped upon it (to prevent formation of mould in the vesuvian solution I usually add a small piece of camphor when it can be kept indefinitely). After two minutes it is again, thoroughly washed in distilled water, dried removed upon a 1-2 m.m. thick object glass, and examination is simplified if a drop or two of distilled water is added just previous to placing it under the microscope or if it is to be put up permanently as a specimen either Canada balsam or Damar varnish answers very well.[4]

OTTO W. FENNEL, M. D.

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[4] After reading this paper one can visualize the earnest mind of Otto Fennel, still slightly troubled by Virchow's dualistic heresy, struggling for precise knowledge and exact methods. How delighted he would be to play around with modern concentration and culture methods, with fluorescent dyes, and with all the new scientific instruments in a modern tuberculosis hospital from which most of the patients are discharged alive and well instead of dead.—D.W.C.

Comment

R. N. PERLSTEIN, M. D.

This letter of Dr. Otto Fennel to the Cincinnati Lancet and Clinic is a historical document of great interest and importance. Its author reveals himself as a scholarly person whose knowledge of the subject was profound and whose mind was capable of accepting and correctly assessing a new revolutionary discovery. It must be remenbered in this connection that the study of tuberculosis was very old historically even in the year 1884 and many of its concepts and votaries heavily calcified. It took a whole galaxy of young men, many of whom were in the category of genius, to break down the old fixations and to establish a clear etiological picture of tuberculosis.

Chief among these, and a master of clear thinking and brilliant methodology, was Robert Koch, the centennial of whose birth occurs on December 11th of this year. But to appreciate the men who worked in this golden age of Germany and of medicine, one must go to the biographies of two of our great Americans, William Henry Welch and Hermann Biggs. Welch was in Cohnheim's laboratory in Breslau in 1876 when Koch demonstrated the life cycle of the anthrax bacillus and remembered the tremendous enthusiasm of the professor and his prediction that this was "the greatest discovery of modern times."

He was not far wrong. The men present on these two occasions (there were two such demonstrations) were witnessing the acouchement of a lusty infant—bacteriology. With the enthusiastic support of the botanist Cohn, and the first great experimental pathologist Cohnhelm, and with the new stains of Weigert and Ehrlich, Koch spent the next few years as an assistant in the Kaiser Wilhelm Institute in Berlin, working on the bacteriology of wound infection. In the summer of 1881 he began his work on the etiology of tuberculosis. On March 24, 1882 he read a paper to the Berlin Physiological Society under simple title "Ueber Tuberkulose" and published it in the April 10th issue of the Berliner Klinischer Wochenschrift. The title had been changed to read "Etiology of Tuberculosis." It still remains a model of the perfect scientific paper. All the requirements of scientific exactitude were met. The organism had been isolated, stained, identified and named. It had been cultured and inoculated into animals; had given them the same disease and had been recovered from their body tissues.

The effect of this discovery was electric in most circles of the medical world. There were many sceptics both in and outside of Germany. The great Virchow was not convinced. Austin Flint in New York received the news with great enthusiasm. Loomis in the same city said "The bacterian theory, which so recently has occupied the attention of medical men, especially in Germany, is rapidly being disproved, and consequently is rapidly being abandoned." Loomis would peer around him while lecturing and remark with heavy irony "People say there are bacteria in the air, but I cannot see them." The Illinois State Medical Society reported to its members that Koch's bacillus was probably "only one of the mere accompaniments of certain deteriorative changes in organic matter and possessing no causative relation whatever and that there is therefore nothing in the present status of investigations on this subject that will either justify the isolation or quarantine of the victim of tuberculosis, the disinfection of his sputa, or the expectation of curing him by germicides. These remarks apply equally well to nearly all the other diseases with which some variety of bacterial germ has been associated." Lastly a medical gent named Farmad in Philadelphia produced the following bit of Americaniana. "A great deal of good pathological work is done in America. Admiration of European pathological works is certainly justifiable but this forms no good reason why the good honest work of Americans, even that of young men, should be left unnoticed."

It is important to remember only that Otto Fennel was among those who accepted and learned and that he reported his information lucidly and well from that very Goettingen where Koch graduated in medicine. He wrote with a rare degree of scientific background and with probably more restraint than his son would have exercised in his place.

The last published paper of Robert Koch was produced in 1910, the year of his death, and is on the epidemiology of tuberculosis. It is as nearly perfect as any of his works. It gives mortality figures of Prussian cities. It points to the difficulty of obtaining reliable morbidity figures (this is still true). It discusses crowding, bad housing, bad hygiene as causes of tuberculosis among the poor whose scourge it has always been. In the clear incisive style which was his, it points to the simplest method of ridding a community of tuberculosis—the building of facilities for the isolation and cure of all open cases and their conscientious retention and treatment in such institutions until they have been rendered non-infectious. Perhaps here, too, he was right.

Epilogue

E. A. FENNEL, M. D.

My father died in 1908, three days before I entered medical college. Of course, I knew he was a doctor, but I did not know whether he was a good one or a poor one. It is very gratifying therefore, after these many years to stumble across these writings of his and to find his then mode of thought and conclusions so basically correct even in the face of the great forward strides in the study of the tubercle bacillus, and its results, made since then. If he could come back for a while, how I would enjoy showing him how we do things now—the reading of technically perfect chest x-rays, the modern cultural methods, the beautiful specimens of tissue made possible by the newer staining techniques. I would enjoy showing him his own little microscope which we still use to control staining. But most of all would I enjoy showing him the results of modern therapy—his "proper regimen" of nearly sixty years ago.

Cigarette Smoking as a Factor in Sterility

LYLE G. PHILLIPS, M.D.
Honolulu

Various intoxications have been suggested as etiological factors in sterility in the human being by various authorities, and in some writings excessive use of tobacco has been mentioned as a possible cause of infertility. Careful search of available literature by this writer has failed to bring to light any definite evidence previously recorded in support of this assumption. However, the following case history suggests that cigarette smoking may sometimes be responsible for sterile mating.

CASE REPORT

Mrs. R. M., age 27, sought advice in September, 1937, in regard to her failure to become pregnant. She had been married five years, and during the first two years of her marriage had used a diaphragm pessary for contraception but for three years had employed no contraceptive measures.

Her past history was insignificant except for a mild attack of pleurisy in 1930. Her health since that time had been consistently good. Her menstruation began at the age of 14 and her periods had been regular at all times, with a 28-day cycle and a normal flow lasting usually four or five days. No abnormal discharge had ever been noticed. Her usual weight was about 95 pounds. Her diet was adequate in all essentials. Her only operation was a tonsillectomy.

Her general appearance was that of a healthy young woman. Her blood pressure was 110/68. Physical examination revealed no apparent abnormalities. Examination of the pelvic organs indicated apparently normal development. The cervix was clean, without evidence of infection, and otherwise normal. The uterus was of normal size, shape, consistency, and mobility. The adnexae appeared normal to palpation. Cervical and vaginal secretions were of normal alkalinity and acidity respectively. Her blood count was normal. Urine was normal, and her basal metabolic rate was normal. Wassermann and Kahn and sedimentation tests were negative.

The Huhner test was performed on September 18, one-half hour after coitus. Secretions removed from the vaginal vault contained well-formed sperm in apparently normal numbers, but none showed any motility whatsoever and all were apparently dead. On September 20, sperm collected in a well-washed condom likewise contained myriads of sperm, all apparently dead.

The Rubin test, performed September 27, 1937, indicated that both tubes were normally patent.

The husband, R. M., age 33, was subjected to thorough examination. He was apparently in good physical condition, without symptoms of any kind, and without apparent physical abnormality. He was a robust individual and his only departure from exemplary habits was the use of from 20 to 30 cigarettes a day. Blood and urine examination were negative. His Wassermann and Kahn were negative. Sedimentation rate was 3 mm. in 60 minutes. His diet as described was adequate in regard to essentials. His basal metabolic rate was minus 2 per cent.

In the absence of any apparent explanation of his production of abnormal sperm, it was suggested that he stop smoking in order that the effect might be noted. He complied, and after November 1, did not smoke. On December 1, a semen specimen collected in a washed condom was examined and found to contain well-developed motile sperm in normal numbers.

Mrs. M. menstruated in December and January, but her February period failed to occur. During these months Mr. M. did not smoke. On October 14, 1938, Mrs. M gave birth to a normal male child.

In February, 1939, Mr. M., who had resumed smoking and was using about two packages of cigarettes a day, was requested to submit a semen specimen. This was brought to the office in a well-washed condom immediately after intercourse and was found to contain, as before, well formed, mature appearing spermatozoa in normal numbers, but all apparently dead. Mr. M. agreed to forego smoking and to repeat the test one month later, and on March 12, 1939, mitted a semen specimen containing large numbers of well formed, mature spermatozoa, all normally active and motile.

SUMMARY

Evidence is submitted in the above case report tending to indicate that in this case, cigarette smoking was apparently a factor in causing infertility.

"MANPOWER" . . .
and the Menopause

"MANPOWER" in industry is rapidly changing to "womanpower." And, with so many women on production and assembly lines, the problem of absenteeism and lowered efficiency, particularly among women in their forties, deserves consideration.

It has been estimated that 80 per cent of women in this age group experience menopausal symptoms of varying intensity. Efficiency demands that these workers be physically and emotionally fit. Clinical investigations show that, in a large percentage of cases, they can be kept "on the job" through the use of adequate estrogenic therapy.

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EDITORIALS

PRENATAL SEROLOGIC TESTS FOR SYPHILIS

The record of the 1943 Hawaii Legislature as far as medical legislation is concerned was not all bad. House Bill No. 316, now Act 219 of the Session Laws of 1943, "an act to prevent congenital syphilis . . . ", was a wholly praiseworthy piece of work. It should indeed go far toward the prevention of congenital syphilis. What it requires, in brief and non-legal language, is about as follows:

Every physician attending a pregnant woman shall take a blood sample at the time of the first visit or within fourteen days and shall send it to an approved laboratory for a standard serologic test for syphilis. Midwives and similar attendants must arrange to have such specimens taken for them. The laboratory makes its report immediately to the physician and once a week to the Board of Health. When the physician reports the birth or still birth of a child he must state whether the test was made and when.

As we go to press, certain details regarding the administration of the act have not yet been worked out. An "approved laboratory" means one approved for this specific purpose by the Board of Health. At present only Board of Health laboratories and those operated by the Army and Navy are in this category. Other civilian laboratories may apply for such approval, which will be granted on the basis of past or present evidence of ability to perform serologic tests with satisfactory accuracy.

There is to be a special printed form on which laboratory reports will be submitted. The birth certificates are also to be altered to provide space for recording, not the result of the test, but merely the date it was taken; for the present this information may be written on the back of the certificate.

Failure of either the patient or the physician or other attendant to comply with the provisions of this act is to be considered a misdemeanor and punishable as such. Specific punishment is provided for persons guilty of misusing or divulging information obtained by the operation of the act. The act further specifically empowers the Board of Health to promulgate such additional rules and regulations as may be found necessary for its more effective enforcement.

The firm enforcement of the provisions of this act should certainly drive the incidence of congenital syphilis in the Territory rapidly toward the zero mark during the next few years.

CONTINUOUS CAUDAL ANESTHESIA IS NOT SAFE—YET

It is most unfortunate that the recent advances in the use of caudal anesthesia in obstetrics have been written up in the lay press in such dramatic style, glorifying the "new discovery" as a boon to all expectant mothers. The press would have mothers believe that all there is to it is for the doctor to stick a needle into her sacrum and presto, her pains stop completely while she goes on entertaining friends and finishing her dinner tray just in time to be moved into the delivery room so she can have her baby. Even the local press here got quite excited about this "discovery" and wanted statements from the author about God's new gift to painless childbirth; no such press releases were given out.

Caudal anesthesia is not new to the medical profession and it is not new in obstetrics, having been used intermittently for the past thirty years. The only thing that is new is the idea of connecting the needle to a large supply of analgesic solution and injecting an additional dose when the previous one has begun to wear off. It sounds simple and fool-

proof, but we must all remember that no form of anesthesia is so entirely without risk. This is perhaps doubly true of obstetrical anesthesia. Any and all procedures in obstetrics must be weighed in terms of *safety* to the mother and child; all other laudable features a procedure may have must certainly come in as secondary considerations.

Let us get this clear: *Caudal anesthesia is not yet a safe procedure.* In Baltimore, where much of the original work was done on caudal anesthesia, the procedure was dropped some four years ago when three maternal deaths were traced directly to the type of anesthesia used. Last year Hingson and Edwards published their article in the Journal of the American Medical Association giving their series of 589 cases with apparently no troubles at all; in the very same issue was another article on the same subject by Gready and Hesseltine with a very much smaller series of cases in which they got into plenty of trouble. There will undoubtedly be a flood of literature on the subject because it is an appealing one, and public clamor will probably prompt many physicians to give it a try; lay magazines will probably add further confusion by extolling the virtues, but failing to mention the vices.

From Sinai Hospital in Baltimore comes an article on the subject by Block and Rochberg, in the April issue of the American Journal of Obstetrics and Gynecology, which is most illuminating. They used novocaine instead of metycaine solution and modified the procedures of Hingson and Edwards by using a continuous drip instead of repeated injections of solution. In one case they used 900 cc. of solution without untoward effects. The series of cases was only 39. The article starts off just fine and one is impressed with the simplicity of the procedure, the marked relief given the patients and the evident proof they show that labor was very materially shortened in practically every case; cases of cervical dystocia simply melted away and surgical deliveries were done with ease and without further inhalation anesthesia. It sounded like Utopian contribution to the problem of obstetrical anesthesia.

But wait! Further in the article we come to *"Complications"* and there we see the back-wash which seems to overbalance any and all advantages the method might have. In this small series of cases "nausea and vomiting, dizziness, drowsiness, and in one instance, diplopia" were noted in that order of frequency. Low back pain during the first 24 hours was a frequent complaint and was often so severe as to require one or two doses of morphine for relief. Two cases of apparent neuritis were encountered with severe pain persisting for two weeks. *Five needles were broken off!* The 39th case in the series was the real hair-raiser and it is worth quoting the case history here briefly:

A 22 year old primipara at term was admitted in early labor with 3 cm. dilatation, with a cervix 50 per cent effaced and with the vertex at the level of the spines. Pains were fairly strong and they recurred every three to four minutes. The fetal heart was heard in the RLQ and was of good quality. The fetus was in ROA. After an enema and voiding, she was put in the knee-chest position and a 17 gauge needle introduced into the caudal canal. Suction was made with a syringe and no spinal fluid obtained. Since the patient was complaining of her pains quite frequently she received 10 cc. of the 1 per cent novocaine as the initial dose and then the apparatus was hooked up so that she could get a continuous slow drip from there on.

After five minutes the patient began to complain of some tingling in her feet, a common symptom with caudal anesthesia, but she was able to move her toes. Shortly thereafter, she suddenly lost the power of speech, became very cyanotic, and went into collapse. The patient had respiratory paralysis and her blood pressure and radial pulse disappeared. She was given artificial respiration until she could be intubated and then her respirations were maintained with oxygen through the intratracheal tube. Caffeine, coramine, and adrenalin were administered, as well as heat and intravenous fluids. Respirations were not re-established for 45 minutes, and she had spinal anesthesia for six hours. The caudal had been discontinued at the first signs of distress, but this was not before the patient had received a total of 30 cc. of procaine solution. The patient returned to consciousness one and one-half hours later, and ten hours later she delivered a living child. The mother and baby made an uneventful recovery and were discharged on the tenth day in good condition.

The authors concluded that "no matter how the procaine is administered, the danger of an anesthetic death is still a very real one" and from the one case quoted, one may readily see how they were thus impressed. They further recommend that *the procedure not become routine*, particularly in the small hospital where a competent anesthetist is not always available to cope with the serious complications resulting from accidental introduction of the anesthetic agent into the spinal canal.

Adams, Lundy and Seldon of The Mayo Clinic (J.A.M.A. 122:152 [May 15] 1943, have reported an alternative and probably a safer technic involving the use of a ureteral catheter to replace the needle, the latter being withdrawn after serving as a guide for the introduction of the catheter into the caudal canal. This is a valuable contribution but it does not by any means render the procedure a perfectly safe one or a suitable one for the small hospital. The risks of intravenous or subdural injection and of trauma and infection are still present.

Caudal anesthesia may yet prove a valuable addition to our obstetrical armamentarium but it will require much more research before it is put to general use and then only with a full understanding of its limitations and risks. I doubt now whether it will stand the tests of time.

O. LEE SCHATTENBURG, M.D.

TUBERCULOSIS SURVEY IN HAWAII SCHOOL PERSONNEL

Dr. Wm. F. Leslie and Dr. M. L. Chang, of Puumaile Hospital, completed in May a tuberculosis survey of all employees of the 'Big Island' school system, financed by the Territorial Tuberculosis Association. They examined 796 persons, 785 of them successfully (11 plates were unreadable and have not yet been repeated), of whom only 3 were already known to be tuberculous.

Of the 782 remaining persons, 38—nearly 5 per cent had significant lung findings, as follows:

17 Suspected tuberculosis
7 Healed pleurisy
1 Greatly enlarged hilar node
16 Definite Tuberculosis
8 Minimal
2 Probably arrested
4 Active
2 Dynamic status unknown
8 Moderately advanced
1 Probably arrested
4 Active
3 Dynamic status unknown

Each of the 38 cases was informed of the result of the x-ray and was referred to his or her private physician with specific recommendations for management. In 9 cases hospitalization was recommended.

In 24 cases definite evidence of cardiovascular disease was noted in the films—including 2 aortic aneurysms.

The total cost of the survey was approximately $1100, exclusive of the time given by Dr. Leslie and Dr. Chang. Considering only the 9 cases requiring hospitalization for tuberculosis, the average cost was only $122 per active case.

In line with the editorial comments in the last issue of the JOURNAL, a tuberculosis survey of food handlers on Hawaii is about to be undertaken.

FOOD HANDLERS' CERTIFICATE: II

To the Editor:

I have just read the editorial in the January-February HAWAII MEDICAL JOURNAL on Food Handlers' Certificates, and I would like to let you know that I agree with you 100 per cent.

I am speaking primarily of the tuberculosis side of the picture. Anyone who spends much time doing TB work in this territory is eventually forced to the conclusion that food handling is a hazardous occupation, at least so far as the acquisition of tuberculosis is concerned. This statement sounds funny but it is not meant to be so at all. If you will speak to any of the Leahi gang, they will tell you that a higher percentage of cooks and waiters eventually find their way into the hospital than any other single occupational group. For a long time, it used to be a standing joke, whenever an admission film showed a far-advanced lesion, to inquire what branch of food handling the individual belonged to. I could quote you any number of case histories similar to the one you mentioned. The prize one, I believe, is that of a patient with far-advanced tuberculosis who left the hospital against advice and, as he himself told me, he was too weak to do heavy work, so he opened up a small restaurant. He had to go to three doctors before he found one who would sign a food handlers' permit but the last one was all that counted. Undoubtedly, he spread quite a few bugs around before he broke down completely and had to re-enter the hospital.

My experience since I have been on this island has shown that conditions here are no better than they are on Oahu. Seven per cent of our admissions here last year were cooks or waiters and not one of them was picked up when he applied for a food handler's permit and all of them had considerably more than minimal involvement.

I have felt for a long time that a survey of food handlers with x-rays would be an ideal thing and I have talked the local Tuberculosis Society into financing such a survey.

At a meeting held at Leahi about two years ago to discuss the food handlers' problem, Dr. Haralson stated that it should not be a problem of the Board of Health to rule out TB in these cases but should be left up to the private physician who signs the permits. I absolutely disagree with this for two reasons. For one thing, the best chest specialist in the world cannot diagnose a minimal case with only a stethoscope, and if the individual does have enough involvement to enable a diagnosis to be made by the present method of examination, he can shop around until he finds some doctor who is willing to sign the certificate.

I should personally like very much to see the medical societies, both local and territorial, take a definite stand on this issue and begin to exert a bit of pressure on the Board of Health so that the recommendations you made in your editorial are carried out.

In any event, I am glad that at least one more physician agrees with me that the present system of examining food handlers is a lot of bunk.

WM. F. LESLIE, M.D.
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PROGRESS IN INTERNAL MEDICINE

THERAPEUTIC NOTES ON A FEW NEW DRUGS

Sulfadiazine

Sulfadiazine has been established as the most widely effective and least toxic of the sulfonamides by reports covering wide clinical use. Finland et al[1] suggest the following field of usefulness for the drug: " . . . all cases of hemolytic streptococcus infection; all of the various acute bacterial meningitides; acute gonorrhea; acute infections of the urinary tract; acute pulmonary infections including those caused by the pneumonococcus and streptococcus; and probably also the staphylococcus and Friedlander's bacillus."

Toxic effects attributable to the drug are relatively few and usually mild. Urinary suppression from crystal blockage may occur, and if not promptly recognized and adequately treated may be fatal. Agranulocytosis has been reported. Drug fever, episcleritis and erythema multiforme occur. An editorial comment in this same journal quotes Long's personal communication as follows: "Long found the following incidence of serious toxic effects such as drug fever, dermatitis, acute hemolytic anemia, granulocytopenia, renal complications, hepatitis, peripheral neuritis, and psychosis: sulfathiazole 18.6 per cent, sulfapyridine 15.9 per cent, sulfanilamide 11.9 per cent and sulfadiazine 6.5 per cent."

Succinyl-Sulfathiazole

Succinyl-sulfathiazole (Sulfasuxidine) is a new member of the sulfonamide series. It is similar to sulfaguanidine in its slow absorption from the gastrointestinal tract and its low toxicity. Its particular field of usefulness appears to be in the treatment of infections of the intestinal tract, such as bacillary dysentery, and as an adjunct to surgery of the large bowel. Evidence of its effectiveness in this latter field is reported by E. J. Poth[2].

Promin F

Will any of the sulfonamides prove of value in the treatment of tuberculosis? Experimental work has suggested that Promin may have some value in this disease but clinical confirmation so far has been lacking.

Feldman et al[3]. demonstrated that Promin has definite deterrent action on, i.e., its use results in lessened spread and changed character of lesions of tuberculosis induced in animals. Barach et al[4]. report favorable results from administering Promin orally to experimentally infected guinea pigs. Still greater deterrent effect was obtained in animals by inhalation of nebulized Promin.

No such favorable results were obtained by Zucker et al.[5] in human patients with relatively early nondestructive tuberculosis. Administration was by intravenous drip. Adequate blood levels were obtained and the course of four weeks' treatment was repeated in 5 of 12 patients. Adequate trial of treatment was therefore given, and though only relatively mild toxic reactions occurred, no beneficial results were observed except the unexpcted healing of one case of tracheo-bronchial tuberculosis.

Penicillin

Antibacterial substances derived from fungi and other microorganisms offer new possibilities for the cure of infectious diseases, somewhat reminiscent, perhaps, of bacteriophage. The new interest goes back to the work of DuBos who in 1939 described the isolation of a metabolic product of the soil bacillus (B. Breus) which possessed a very high degree of bactericidal activity against gram-negative organisms. Later a fraction was found which proved to be effective against both gram-positive and gram-negative organisms. This substance, Tyrothricin, has a limited field of usefulness because of its hemolytic action.

Penicillin, a substance extracted from culture of the fungus, Penicillium notatum, is apparently effective against a wide variety of microorganisms. Unlike drugs of the sulfonamide series, its bacteriostatic action is not interfered with by body fluids or by pus, and only to a limited extent by very large numbers of organisms. It has low toxicity to tissue cells and may be administered safely by parenteral routes. It is inhibited by acid gastric juice and is rapidly inactivated in the body.

Favorable therapeutic responses (but no cures) were reported by Abraham et al[6]. in several apparently hopeless cases of staphylococcus and streptococcus septicemia, after other measures had failed. Penicillin accomplished sterilization of the urine in a case of serious staphylococcus aureus urinary tract infection when administered by mouth. Applied lo-

cally to the eye, it was effective in controlling infection resistant to other measures.

Difficulties of production, standardization and administration appear obvious in this report and much more investigative work will be necessary before the place of Penicillin in our therapeutic armamentarium is established.

Digitalis

Variations in potency of digitalis are noted in recent articles about cardiac drugs. Following the change of assay method of the U.S.P. XI revision of 1936, many preparations of digitalis increased in potency to as much as 150 per cent of older preparations. The forthcoming twelfth edition of the U.S. Pharmacopoeia provides assay by the cat method and a drop of potency of about 25 per cent over present strength is anticipated in many products. Human assay as proposed by Gold[7] may be the next logical step. Meantime, in practice, since there are variations not only in drug potency but in individual response, it is necessary for the physician to observe clinical effects very carefully in each patient. The method of administration selected depends upon the patient's need for rapid or slow digitalization as the case may be.

A digitalis glucoside, Digitoxin (Digitaline Nativelle) has been restudied by Gold[7] and found to be safe to administer by a single therapeutic dose to patients who have had no previous digitalis and are in urgent need of digitalization. Vomiting was induced in only 1 out of 50 patients with the glucoside, as compared with 1 in 5 with digitalis. Full therapeutic effects were obtained in from six to eight hours. The glucoside is effective in relatively small doses because of complete gastro-intestinal tract absorption. The full therapeutic dose is of the order of 1.25 mgm., or only 3 cat units, as compared with an average of 15 units of digitalis leaf or tincture.

Dicoumarin

Dicoumarin, an orally effective anticoagulant, was synthesized by O. A. Meyer[8] and his associates at the University of Wisconsin to resemble the effective hemorrhagic agent obtained from spoiled sweet clover (which causes hemorrhagic disease in cattle). The chemical name of the substance is 3,3' methylenebis (4-hydroxycoumarin). The name Dicoumarol has also been applied.

Its action is to delay blood clotting, chiefly by prolongation of prothrombin time. It also impairs clot retraction and increases red blood cell sedimentation rate. The action is somewhat delayed but is accomplished readily by oral administration. This latter feature and its low cost are its principal advantages over heparin. Blood transfusion readily counteracts its hemorrhagic effects.

The principal uses suggested for this new drug are as a prophylaxis against postoperative thrombosis and embolism and the treatment of pulmonary embolism and of thrombophlebitis. In spite of a number of favorable reports of clinical application, the field of usefulness of this drug and its details of administration have not yet been established.

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RECENT ADVANCES IN SURGERY

APPENDICITIS SIMULATING MALIGNANCY OF THE CAECUM

Appendicitis as the cause of inflammatory mass in the right lower quadrant which may be mistaken for malignancy, tuberculosis of the caecum, regional enteritis or actionomycosis has received scant mention in recent medical literature.

Mention is made in Kelly and Hurdon's book, *The Vermiform Appendix and its Diseases*, of a report by A. Gerster in the New York Medical Journal in August, 1902, of such a case. A man of 20 presented the following points of resemblance to a neoplasm of the ileocecal region: a large rounded tumor of gradual development, movable, giving very little pain when patient lay quietly in bed, and not accompanied by chills nor rise of temperature, the bowels being regular. The chief points in favor of the inflammatory nature of the tumor were the age of the patient, and especially the history of three previous attacks suggestive of appendicitis.

In the Surgical Clinics of North America for February, 1936, Christopher discussed inflammatory tumors of the caecum simulating acute appendicitis. Three cases were cited: one was regional ileitis, one was a carcinoma in the caecum in a male of 28, and the third was diverticulitis of the caecum. He drew attention to the fact well known to all of us that an appendectomy may be one of the simplest or one of the most difficult operations in surgery, and also that one must be prepared to deal with other pathological conditions in the right lower quadrant whenever a patient is brought to surgery with a diagnosis of appendicitis.

Differential Diagnosis

As a rule, new growths of the caecum are more or less freely movable, are more sharply circumscribed, and develop gradually, while an inflammatory mass is less movable, less clearly outlined, and develops more rapidly with acute local findings of tenderness and rigidity, and associated with fever and leukocytosis. A malignancy of the caecal area is also more likely to be associated with change in bowel habits, with partial intestinal obstruction, with anemia, with gross or occult blood in the stool, and with filling defects as shown by barium enema. These findings may not be sufficiently distinctive in any given case to permit of a differential diagnosis and only by exploratory laparotomy can the true nature of the condition be determined.

Diverticulitis of the colon, particularly of the sigmoid area, commonly gives rise to an inflammatory mass that cannot be differentiated preoperatively from malignancy. This is of less frequent occurrence in the caecal region, because diverticula occur more rarely in this area. The three following case reports of inflammatory lesions in the caecal area, the result of appendicitis, illustrate the points just discussed.

Case Reports

CASE 1. Queen's Hospital, No. 93574. In August, 1935, a Japanese woman, age 48, was referred from Kauai by Dr. Marvin Brennecke with a provisional diagnosis of carcinoma or granuloma of the caecal region. Several weeks previously the patient had noticed some abdominal discomfort in the right lower quadrant, and on examinatiion a tumor had been palpated in this area. There was very little tenderness in this region, and no muscle spasm. The highest temperature on several occasions was 99.2 F. Two months previously she had apparently passed chyle in the urine but none was present at this time and the urine was otherwise normal. Cystoscopic examination and pyelograms were negative. Urine cultures were sterile. Pelvic examination was negative; the tumor was lying higher than one would expect from a tubo-ovarian involvement. Barium x-ray studies showed a slight filling defect in the region of the caecum.

Operation, August 13, 1935: Under spinal anesthesia a right rectus incision was made. A mass was encountered along the inferior edge of the caecum and terminal ileum that was at first interpreted as being due to malignancy. However, on exploring the appendix it was found to curve around beneath the ileum, and to have ruptured near the tip. There were 1 or 2 cc. of pus in this region, with a large amount of surrounding inflammatory reaction. Removal of the appendix was followed by recovery. Microscopic examination of the appendix revealed only inflammatory reaction.

CASE 2. Queen's Hospital, No. 137503. A Japanese man, 44 years of age, was seen on October 10, 1940. The history revealed that one month before he had noticed some soreness in the right lower quadrant and had felt a lump in this region. The symptoms, and the tumor, so far as he could determine, disappeared in a few days and he thought no more of it until the same findings, associated with diarrhoea, recurred during the past few days. His bowels moved four or five times a day but he had not noticed any blood in the stool.

On examination there was a firm, freely movable mass in the right lower quadrant, very slightly if at all tender; there was no muscle spasm. Rectal examination was negative. Temperature at 4 p.m. was 99 F. and at 8 p.m. 98.6 F. Red blood count 4,500,000; hemoglobin 71 per cent or 10.8 grams; white blood count 7,900, polymorphonuclears 75 per cent, small lymphocytes 20 per cent, monocytes 4

per cent, eosinophiles 1 per cent, no left shift, no abnormal cells. The blood Wassermann, Kahn, Eagle and Lauglen reactions were negative. Examination of feces showed no gross or microscopic blood and no parasites. X-ray of chest was negative. Colon x-ray showed a constant filling defect in the caecal region which we thought was quite compatible with malignancy. The patient being in good general physical condition, exploration was advised. We felt quite certain from the data we had gathered that we were dealing with a carcinoma of the caecum.

Operation, October 18, 1940: Under spinal anesthesia a right rectus incision was made. A greatly thickened appendix was found, surrounded by inflammatory reaction, with thickening of the base of the caecum. No abscess was present and no point of rupture of the appendix could be identified. The terminal ileum was normal and nothing was found suggesting a regional enteritis. The appendix was removed. The microscopic diagnosis was subacute appendicitis. The patient made an uneventful recovery and has remained well since.

CASE 3. Queen's Hospital, No. 159996. A Hawaiian woman, age 37, had developed pain in the right lower quadrant approximately two and a half or three months before. The onset was acute, with temperature 103 F. She was examined by a physician soon after onset of symptoms and he suspected (so she stated) trouble with her appendix. A practitioner of another art later thought to dispel the trouble by massage. Sometime after this she became conscious of a mass in the right lower abdomen. Aside from the first few days she had not been acutely ill and the pain had resolved itself into a feeling of discomfort in the right lower quadrant of the abdomen.

On examination there was found a fixed, firm mass somewhat to the right of McBurney's point. It was only slightly tender, and on bimanual examination did not seem connected with the pelvic organs. The temperature on several occasions was normal and preoperatively did not rise above 99.4 F. The general physical examination was negative. The red blood count was 5,300,000; hemoglobin 80 per cent or 10.7 grams; white blood count 9,400, polymorphonuclears 62, per cent, small lymphocytes 25 per cent, monocytes 9 per cent, eosinophiles 4 per cent. Urine examination negative. Intravenous pyelograms showed nothing abnormal except that the right psoas muscle was less clearly outlined than the left, and there was considerable ptosis of the right kidney. X-ray of the colon showed no filling defect of the caecum, and under fluoroscopic examination the mass seemed to be just below and to the outside of the caecum. Again the question arose as to the nature of the lesion, and again we were suspicious of malignancy but were more inclined to consider appendiceal involvement or some other inflammatory reaction because of the two previous experiences just described.

Operation, October 6, 1942. Under cyclopropane anesthesia (spinal anesthesia was contraindicated because the systolic blood pressure was only 92 mm. Hg) an incision outside the right rectus muscle was made. The appendix was found curled back along the under surface of the caecum, its tip lying against the lateral abdominal wall and surrounded by a small abscess, about the diameter of a twenty-five cent piece, which had burrowed into the abdominal muscles. There was also a small perforation leading from the distal and mid-third of the appendix through the wall of the caecum. The appendix was removed, the region was thoroughly dusted with 6 to 8 grams of sulfanilamide crystals and the incision closed tight. Ten days later an intra-abdominal abscess was drained through a stab wound just inside the anterior superior spine. After this an uneventful recovery took place.

The pathologic examination showed a greatly thickened appendiceal wall due to fibrous tissue and fibroblastic proliferation. Section showed a cellular exudate on the surface with many polymorphonuclear cells. The ceco-appendiceal fistula was identified.

Discussion

In the differential diagnosis of a mass occurring in the right lower quadrant one should always consider the possibility of the lesion's being inflammatory, either from a ruptured appendix or from a ruptured diverticulum. We are accustomed, because of its usual occurrence, to think of a ruptured appendix as giving rise to an acute inflammatory process characterized by acute pain, tenderness, muscle rigidity, fever and leukocytosis. That such may not be the case is shown by the three cases just cited.

Since Crohn, Ginzburg and Oppenheimer in 1932 described the clinical entity of regional enteritis, we have had a watchful eye open for this condition. If encountered, it has not been recognized clinically; and in no case at the time of operation has any pathological condition been seen which fitted into this picture. Perhaps it will become prevalent here in the future, as has been the case with thyroid disease, which was a clinical curiosity in Hawaii until comparatively recently.

As previously mentioned, acute and chronic inflammatory lesions, usually the result of diverticula, are preponderantly more commonly encountered in the region of the sigmoid colon. It is everyone's experience at times to be unable to differentiate between a malignancy of the sigmoid and an inflammatory tumor, the result of diverticulitis, until the abdomen is opened and occasionally even until the microscopic pathological report has been completed.

It is my impression from personal experience that one will find, in 1 or 2 per cent of the individuals operated upon for acute appendicitis, that the trouble is due not to the appendix but to a diverticulitis of the caecum. These diverticula, or at least the ones I have seen, usually arise at the upper margin of the caecum on its lateral aspect and may be easily overlooked if the condition is not thought of and adequate exploration made. In at least one individual whom I have observed, a tumor in thee caecal region thought to be due to malignancy was found at operation to have resulted from diverticulitis.

In concluding these remarks, I wish to emphasize the fact that one always has to consider the appendix as the disturbing factor in the causation of a lump in the right lower quadrant.

J. E. STRODE, M.D.

CLINICO-PATHOLOGIC COMMENT

REVERIES OF A SENESCENT PATHOLOGIST: II

Now let us go back to the Cinderella—the Cinder Ella—of the laboratory: poor little Bacteriology.

From a review of some of the local hospitals' annual reports (St. Francis, for example)—it becomes obvious that their staffs are using wisely the departments of clinical chemistry, serology and hematology and urinalyses, much more than in the previous year, but are sadly neglecting bacteriologic investigation. The annual report of St. Francis Hospital, in press, shows the following:

Department	1941	1942
Serology & Hematology	10,921	14,151
Chemistry	345	514
Urinalysis	4,005	6,641
Bacteriology	578	594

The lack in bacteriology is obvious.

At Queen's Hospital, to be sure, the laboratory procedures dropped from 70,844 in 1941 to 51,680 in 1942, but the relative decrease is most noticeable in the field of bacteriology. General smears dropped from 845 to 735, sputum from 865 to 552, throat cultures from 165 to 94, blood cultures from 218 to 202, gonococcus cultures from 2,014 to 919 and miscellaneous cultures from 534 to 365. The fall in sputum examinations is particularly reprehensible. It seems to be the fashion to do the ten dollar x-ray first and the two dollar sputum last.

Of course, it is true that many of our diseases have a virus as an etiologic agent, and that there is not one laboratory in all Hawaii—neither private nor public health—competent or set up to investigate viruses, which fact is rather discouraging to the progressive practitioner, but no excuse for not making every effort to incriminate a bacterium, if there is any possibility at all, of being the etiologic factor.

In the early days of the clinical laboratory, Bacteriology consisted chiefly the study only of stained smears of pus, sputum, and other secretions and excretions. There was a variety of stains. Aniline gentian violet was the sheet anchor; it was nasty to make up and apt to spoil; it had an aroma that can make many an old timer nostalgic. Besides, there were carmine, methylene blue, safranine, fuchsin and Gram's stain. (It is interesting to note how early in the history of Bacteriology Gram's stain helped us separate the positive goats from the negative sheep; as interesting as the very early discovery, in the history of syphilis, that mercury was useful in the treatment of that disease. And, speaking of history and the dyes used early in Bacteriology, it is interesting to remember that Robert Koch first saw the tubercle bacillus as a blue rod and not the red bacillus that has fixed itself in the mind and memory of every intern of the last twenty-five years. With the relatively recent advent of Fite's improved technique for the staining of acid fast bacilli, whereby those organisms appear as blue-black rods against a dissimilar background, those of us bacteriologically minded may shake hands across the ages with Pasteur, Koch and Gram.)

In those days there were very few culture media. Please remember that the pioneer, Pasteur, worked only with fluid cultures and that Koch, within his lifetime, almost as one man alone—did I say "alone?"—not only put this department on a scientific basis but brought it to near-perfection. He did so with the aid of his first wife, who, from her kitchen, gave him the hint of gelatin, a solidifying medium (from calves' hooves and not out of a paper carton) to hold the colonies isolated, to the production of pure cultures, the offspring of a single organism. Agar followed—as did a second wife, who could sing but not cook, for Koch.

In the early days we had beef extract broth and agar (Liebig is a name the old timers will remember), gelatin and Loeffler's medium, and very few others. Thereafter the bacteriologic physician got lost in a maze of fermentable sugars and he has not yet come out of the morass. Incubators were heated by kerosene or gas, and fluctuated violently; anyone who could cultivate a tubercle bacillus was a master; typhoid was diagnosed by symptoms, not cultures, but was confirmed by the Widal reaction; and the gonococcus and meningococcus just simply didn't grow in a test tube, any more than did—or does—then B. (now M.) leprae. The bacteriologic picture has been changed by a great many factors, but none so important as (1) pH, (2) Difco, (3) sulfa compounds, (4) knowledge of bacterial respiratory needs, and (5), at least for us, plastic molded bottle caps.

pH

The symbol pH (or *p*H) means the logarithm of the reciprocal of the hydrogen ion concentration, and not 'degrees" of acidity or alkalinity, or the total content of alkali or acid. You are not interested in the total salt content of that pot of soup on the stove but you certainly are quite interested in how "salty" your particular plate of it is. Just so with the bugs. Just so also with your stomach. Who cares how much hydrochloric acid your dilated or contracted stomach contains; the poor little cells want to know only how concentrated that HCl is; is it pure, dilute, or very, very dilute? But many clinicians still think in terms of "degrees" of acidity.

During the last war, 1918-19, when I was making pneumococcus vaccine, it seemed such a great pity to cut up, grind up and cook up, each night, half a cow to make soup, which was titrated to neutrality with phenolphthalein as an indicator, and then to add so and so much additional sodium hydroxide to so many *degrees* of alkalinity; possibly that batch would not grow a single pneumococcus. Then, on the following night, with the other half of the same cow, with the same technique, a broth resulted that gave such abundant growth as to be quite milky. But when we found out how to adjust the reaction for hydrogen ion concentration—the only language living cells can understand—by the use of phenolsulfonphthalein (phenol red) or thymol blue, or some other dye that changes color at a given pH, the large batches of broth—hundreds and hundreds of liters that had been going down the sewer—consistently gave good growth. So today the pH method is universally used. The pH is estimated with an electric gadget (rather expensive and complicated) or a colorimetric one (quite cheap and reasonably accurate, with a wide variety of dyes with ranges from acid pH 1.2, over neutrality pH of 7, to alkaline pH 9.6).

Difco. et al.

At about that time clinical laboratories began, then, to take more interest, not only in the reactions of the media used, but in their available food content. This stimulated the manufacturers to the production of various perfected peptones, which far surpassed the previously accepted standard "Witte's", of German manufacture. Culture media consisted in those days, essentially, of meat extract, peptone, and salt, with or without the solidifying agents, agar or gelatin.

Meat extract—beef tea—is, as Martin Fischer has so succinctly said, only the urine that the cow was unable to excrete before she was slaughtered. It may be a stimulant or a nutrient—both, or neither—to bacteria.

Peptones were the meat of the cow—those complex living cells, caught at different distances down the slope, as they cascaded from the complex protein molecule toward the simple amino acids.

Salt was salt—the electrolyte needed in all biologic activities.

A wide variety of recipes for media then made its appearance; hormone broth and agar, brain media, liver media (vitamins hadn't been invented yet, save for the anti-beriberi one, and whoever heard of a bacterium with beriberi?) until the bacteriologic literature looked like Fannie Farmer's Cook Book. Any clinical bacteriologist, trying to keep up with the times, spent most of his time steaming over a cook-stove, and he was sure to invent a medium of his own. Bacterial dietetics was the watchword of the day.

Then came the Difco people (Digestive Ferments Co., of Detroit), pioneers in their line. They made a great variety of these newer, complicated media, as well as the old, extracted the water, and marketed them in dry powder form. All one had to do was add water to dissolve, and without even bothering to set the reaction to the desired pH, autoclave the medium. Now, instead of having the laboratory shelves (or worse, the ice box) all cluttered up with fifty or so large batches of different culture media, going to waste by drying up in their test tubes, those same shelves hold bottles of dried powder that can readily and economically be made into small batches of the required medium on short notice.

More recently, other firms have come into this field, notably the Baltimore Biological Laboratory, who make the very useful Brewer's medium. This is a pork infusion broth containing a reducing reagent, sodium thyoglycollate, which permits one to grow in one liquid medium either anaerobes, microaerophiles or aerobes, or all three.

Clinical bacteriology was greatly stimulated, but the response from the clinician still left much to be desired. *Clinical* bacteriology is quite different from *determinative, analytical* bacteriology. In the latter the problem is, for example: "Here is a gram negative rod; what is it? Determine by all available cultural and other methods its exact genus and species and strain, if possible." Ideally, the problem in *clinical* bacteriology might be typified as follows: The clinician says to the clinical bacteriologist, "Here is my patient; he has such and such symtoms, which lead me to believe he has typhoid fever (or perhaps he says brucellosis or infectious endocarditis, or diph-

theria). What do you think? You were a doctor once. What do you advise and how shall we collect properly the needed specimens?" (This is pure fiction; very few clinicians ever talked to me as understandingly as that, during these past twenty-six years that I have labored in this field). Then the clinical bacteriologist has one or two or three leads that he may follow intensively. The greatest need today in clinical bacteriology is closer cooperation and consultation between clinician and bacteriologist, before, not after, the specimens are secured and the cultures made. Even if this consultation brings the laboratory an unusual request, the presence of the dried culture media gives it confidence and the assurance that it may meet all ordinary and most extraordinary emergencies; thus it welcomes the unusual problems rather than, as formerly, trying to avoid them.

The Sulfa Compounds

For a while it seemed that this ideal relationship between clinician and bacteriologist was about to be achieved, for, as each new sulfa compound made its appearance, it was supposed to be more efficacious with certain species of bacteria than with others. And so a great interest was aroused in the clinician, with reference to the specific cause of the condition he was treating, and he began to take a new interest in clinical bacteriology.

That boon went *boom* with Perrin Long's dictum that sulfadiazine would affect all the bacteria in like manner as all the other sulfa compounds, and with less toxicity to the patient. That may or may not be true, but it nearly ruined the clinician's budding interest in bacteriology. He began to prescribe sulfadiazine immediately, requesting cultures only later or when things were not going as anticipated, and thereby increased the difficulties of the clinical bacteriological laboratory; for the presence of sulfa compounds in the infected specimens presented for culture markedly inhibited or prevented the growth of organisms. This difficulty was a very considerable one until it was discovered (Janeway III contributed this aid) that para-amino benzoic acid (which is found in some of the better peptones) when added to culture media in a concentration of, say, 5 to 7 mgm. per cent, in a great measure neutralized the effect of the sulfa compounds. So today, practically all culture media on our laboratory shelf contain this acid, since most specimens for culture come from patients who have been talking sulfa compounds, either at the direction of their doctor or on their own initiative. We are under the impression that this content of para-amino benzoic acid in culture media, even though the cultured material may contain none of the sulfa compounds, enhances the nutritive value of that medium.

Bacterial Respiratory Needs

"When I was a young man before my hair was grey" we knew that there were obligate anaerobes, but culturing B. (now Clostridium) tetani from tissue was such a messy problem indeed that nearly every clinical laboratory gave it up as a bad job. All it got us was a negative result or a mixed culture and a lot of pyrogallic acid stain on the fingers of the laboratory personnel. And when, once in a while, the typical gram-positive drumstick bacillus was recovered in pure culture, it did not help the patient—he had died two days previous with risus sardonicus, for there was no adequate, *generally accepted* way of treating tetanus in those days—before my hair was grey—than there is now. Risus sardonicus!

In 1908 Nowak discovered that if the available oxygen was reduced and the carbon dioxide was increased, Bang's bacillus (now called Brucella abortus) grew more consistently and luxuriantly. In 1918 Wherry and Oliver showed that these gaseous conditions, then called "partial tension cultures," markedly enhanced the growth of the gonococcus. I myself, working in their laboratory, in 1916, found a streptothrix in carious teeth that was an obligate micro-aerophile; it would not grow aerobically nor anaerobically but only under partial tension conditions. It was the subject of my first medical publication, in the Journal of Infectious Diseases.

Other germs were added to the list that grew best—particularly in primary cultures—under partial tension (now called 'capneic" or "mephitibic") conditions. These considerations were sadly neglected or forgotten until the national ballyhoo against venereal disease became strident; today the laboratory that does not feed its gonococcus the proper food and give it the proper air to breathe is apt to be arrested for cruelty to animals or malpractice. Many ingenious methods of creating these atmospheric conditions have been evolved; any are satisfactory if they produce the desired gaseous environment. Some are more laborious than others. But the gaseous environment is quite as important as the food—the culture medium—on which the bacterium is artificially grown.

Molded Bottle Caps

I should like to conclude my reveries by saying a kind word for molded bottle caps. They crept into the medical world at about the same time as the vitamins; they have been far less advertised and far more useful. The cork tree, under which rested Ferdinand the Bull, can now be sacrificed without compunction, and Ferdinand may have to return to the bull ring.

The molded bottle cap stands autoclaving and does not shrink during the weeks, months or years. One-ounce bottles have replaced, in our laboratory, cotton-stoppered test tubes; and two-ounce bottles, with molded stoppers, have replaced petri dishes. The moisture is conserved indefinitely.

If the molded, screw-on bottle cap has a hole and a rubber inner liner, replacing the waxed paper one, the air may be exhausted with a hypodermic needle and replaced with any desired gaseous mixture. If that mixture be lowered oxygen and increased carbon dioxide, the modern term is 'capneic"; and I like the term, for the condition is most simply and easily obtained with the aid of these bottle *caps*. The inventor of these bottle caps, that have so altered the work of many fields, including bacteriology, is unknown; but he certainly deserves a medal of some sort with so many being distributed for destruction, not construction, these days.

The clinical laboratory has slowly made progress —very slowly—in bacteriology, but I fear that the clinician has not kept step nor demanded his rights; I fear he knows less bacteriology today than on the day he received his sheepskin. And that being so I fear will condemn Cinderella to be forever a Cinder Ella, sifting ashes, and never give her a chance to wear the glass slippers nor the resplendent clothes.

E. A. FENNEL, M.D.

HAWAII SOCIETY OF CLINICAL PATHOLOGISTS

The Hawaii Society of Clinical Pathologists held a tumor seminar on April 17, 1943, from 7 to 9 PM at Tripler General Hospital (Farrington High school). Sections from 8 cases previously mailed to the men attending were projected on a screen and the slides discussed. Following the meeting refreshments were served by the Army. The following doctors were present: Doctors A. Majoska, Louis Hirsch, Jesse Smith, Harry Arnold, Jr., I. L. Tilden, Cmdr. E. M. Butt, Lt. Cmdr. C. R. Jensen, Lt. I. Chapman, Lt. Bernet, Lt. Col. C. E. Moran, Capt. D. L. Adler, Capt. Levison, Capt. W. A. Hause, Capt. Weiss, Lt. H. Lawrence, Capt. Rosenthal, Major R. C. Wadsworth and Major C. F. Tessmer.

T. L. TILDEN, M. D.
Secretary

EMERGENCY MEDICAL SERVICES

(FORMERLY MEDICAL PREPAREDNESS)

Report made at the Annual Meeting of the Honolulu County Medical Society

Since the details of the operation of the Medical Section of the Office of Civilian Defense have been reported in each issue of the JOURNAL, it is not thought worth-while to repeat this information here. The minutes of the meetings of the Preparedness Committee, which have been very few in the past year, are on file in the office of the Society and may be consulted by anyone who is interested. It is, however, probably worthwhile to enumerate some of the completed medical projects to give you an over-all idea of our activities.

On this island, Sacred Hearts Hospital has been in operation for a year this month, has treated approximately 2,000 patients in that time and has done nearly 200 major surgical operations, but, of course, has treated no war casualties and it is hoped that it never will. About 50% of the patients are employed on defense contracts and are hospitalized for illness and industrial accidents. The balance has been largely the overflow from overcrowded hospitals in the city.

Wahiawa Hospital has also been in operation approximately one year, but with a very much smaller volume of business and, unlike Sacred Hearts Hospital, has been used very little by private physicians. Most of the work at Wahiawa has been the care of the dependents of officers and soldiers living near Schofield Barracks. Elementary essential medical equipment for a small hospital, including surgical and obstetrical materials, has been provided in three rural areas for the care of evacuees who might not be able to travel as far as Wahiawa. They are respectively at Kunia and Kipapa Schools and at Waimano Home. The instruments, drapes and dressings are sterilized and hermetically sealed in large tins with the list of the contents on the cover. A 100 bed addition for the treatment of ambulatory tuberculosis has been added to the Wahiawa Hospital and will commence operation as soon as the balance of the equipment arrives.

Manoa and Shriners' Annex Hospitals have never had any patients*, but are ready for them if the time comes.

In addition to the blackout, ventilation and ramp-escape construction provided for Honolulu hospitals and other hospitals of the Territory, there are several hospital projects which should be mentioned. Two 25-bed wards have been added to Kuakini Hospital to care for the possible occurrence of an epidemic of contagious disease requiring isolation of patients. The construction of a 30-bed isolation unit at Queen's has been approved and construction will start in a few days. This will permit the remodeling of the present contagious wing into a kitchen. A 30-bed evacuation ward has also been authorized for Queen's Hospital to permit the removal of the patients from Liholiho I to this building should it be necessary to move the surgery to Liholiho I. A proposal to construct nurses' classrooms for Queen's Hospital to facilitate the training of nurses has been approved by everyone concerned in Hawaii, and rests with the Interior Department in Washington. Also the plan to construct a 30-bed obstetrical unit adjacent to St. Francis Hospital has been held up by the Interior Department, but it has been urgently recommended by everyone concerned here.

On Hawaii no new hospitals have been built and the work of the Medical Department has been merely to furnish supplies and equipment for the expanded capacity of the existing hospitals. On Maui one hospital has been built at Waikapu and has been turned over to the Army for operation with an agreement that the Army care for civilians if necessary. The other hospitals remain in operation at their evacuation sites mauka. St. Anthony's at Wailuku has been set up by the O.C.D. with a capacity of 30 to 50 beds to care for emergencies. On Kauai the new hospital at Waimea is ready for occupancy as is the one at Huleia. On Molokai, Puu Kolea is ready for occupancy and the High School hospital on Lanai is ready also.

The nursing shortage remains the outstanding serious unsolved problem of this department. The serious shortage of nurses on the mainland, coupled with transportation difficulties, still prevents our importing an adequate number of nurses to fill our vacancies. The last survey shows that approximately 111 nursing vancancies exist in the Territory. In my opinion they will never be filled and the answer to the problem can lie only in conservation of nurses' services by doctors and others and by the training of non-professional personnel to carry out many nursing functions.

*Since this report Shriners' Annex has become the Emergency Poliomyelitis Hospital.—Ed.

Since the war began 9 doctors have retired from practice, 8 have left the Territory, 2 have died, 22 have joined the Army, 11 have joined the Navy and 6 have been detained. This makes a deficit of 58 medical men and there are left in practice on Oahu 206. There are 41 doctors on Hawaii, 20 on Maui, 16 on Kauai, 3 on Molokai and 1 on Lanai. This figure is exclusive of internes in hospitals, but does include physicians in institutions like Kalaupapa and the tuberculosis hospitals. The Army has adhered to its original decision not to activate the commissions of medical reserve officers any further unless the need is overwhelming. I know of no navy reserve medical commissions which have not been activated.

The definite lessening of the war tension locally is leading to a considerable degree of complacency, the justification for which is beyond my power to estimate. A proposal has been made that the hospitals on Maui return to their original sites and the recommendation has also been made that certain aid stations which are now operating on a part-time basis only should be completely closed and merely cared for and maintained ready for use. In my judgment these proposals will probably increase in number as times goes on unless we experience military reverses.

The recent return of many functions of government to civil authorities has presented many serious medical problems in that no substitutes are available for the Army personnel which carried on many of these functions. At the time of this report I am assured by the Department Surgeon that, until further action is taken, these doctors and nurses will not be disturbed in their present duties. This is, of course, not a promise for the future, but good for the time being. Owing to the extremely able assistance of Major Chung-Hoon, who has been in this office since July, 1942, your chairman was able on the first of the year to assume a half-time volunteer status and devote a portion of his time to practice. It is impossible to overstate Major Chung-Hoon's value to this office. His intimate knowledge of the Territory as a whole and of the doctors and hospitals in it has made him more useful than any malihini could have been. We medical men are deeply indebted to the Army for his services. Dr. Dickson who has been in charge of the aid stations and ambulance service has likewise gone on a part-time basis and Major Chung-Hoon is carrying some of his responsibilities also.

H. L. ARNOLD, M. D,
Territorial Medical Director, O.C.D.

COUNTY SOCIETY REPORTS

HAWAII COUNTY MEDICAL SOCIETY

The 213th regular meeting of the Hawaii County Medical Society was called to order on February 23, 1943. Fifteen members were present. Captain Flinter of the local Board of Health was guest.

The President read a letter from Mr. Tate Robinson, Director of Health Education of the Department of Public Instruction, requesting the cooperation of the Society in a tuberculosis survey of the teachers and employees of the various schools on the island. Dr. Leslie explained the modus operandi of the proposed survey; he stated that the survey was sponsored by the Department of Public Instruction and was to be financed by the local Tuberculosis Society. He believed that x-rays were to be taken by Puumaile Home and various outlying county and plantation hospitals where these facilities exist, these institutions to be remunerated at a rate of $1.25 per film but at no cost to the school employee. After some discussion, the Society went on record as approving the project.

Dr. Leslie brought up for discussion a survey of direct food-handlers on the island. Dr. Patterson suggested that discussion be deferred until a more definite program had been set.

The Treasurer, Dr. Loo, reported that there was about $800.00 in the Treasury. He stated that two members, Drs. O. K. Tofukuji and H. W. Kurashige, were more than one year in arrears in dues. It was the consensus of opinion that since the constitution and by-laws provided that such delinquent members be dropped from the roll of members and that since these members had been notified to this effect, no action was indicated at this time except to conform with the by-laws.

Dr. Keay, chairman of the Legislative Committee, reported that the committee had come to no definite conclusion in respect to premarital certification of freedom from venereal disease. Dr. S. R. Brown, Councillor of the Territorial Association, reported that at the last meeting of the Council the Territorial Legislative Committee had made no definite recommendations although it was generally agreed that: (1) legislation requiring prenatal examination and serological tests would be passed; (2) legislation requiring premarital examination was doomed to failure because of opposition of powerful organizations. Captain Flinter reported that the Territorial Council of Social Agencies was recommending premarital examination.

Dr. Patterson stated that the H.S.P.A. had recently appropriated $2500.00 to conduct a survey of Weil's Disease; he believed that the survey would be directed by Dr. Alicata of the Univ. of Hawaii with the cooperation of the Board of Health. Captain Flinter stated that the local Board of Health had recently requisitioned material for agglutination tests for that disease.

Dr. Mizuire read the report of the recently appointed Library Committee composed of Dr. Crawford, chairman, Dr. Mizuire and Dr. Leslie. The Committee reported that: (1) the sources of material lay chiefly in the volumes of books and journals now owned by the Hilo Memorial Hospital and in subscription to other journals of general interest. These could be supplemented by loans or donations from Puumaile Home, private physicians and the Territorial Association. It was reported that the latter has duplicate volumes of quite a number of journals which would be released to the Society if the latter so desired. The Committee felt that journals were preferable to books for the maintenance of a current library. (2) The housing of the material would be most conveniently cared for in the staff room of the Hilo Memorial Hospital. Book-cases had already been made available and the recorder's office of the hospitals would serve as librarian. The Committee recommended that for binding the past journals and the establishment of a library, an initial expenditure of $300.00 would be required. Considerable discussion followed. Dr. Keay moved that the Society appropriate $300.00 for the establishment of a library. Carried. Dr. Orenstein suggested that an agreement be made between the hospital and Society whereby the bound volumes were to become the property of the Society rather than of the hospital.

Dr. Patterson stated that he had written a personal letter to Mrs. G. Giacometti, Supervising Principal of Central Hawaii Schools, suggesting that , in view of a recent increase in incidence of trichinosis on the island, an educational program stressing thorough cooking of pork and garbage should be instituted, possibly initiating in the schools on the island. The Society officially approved this move.

The Committee on By-Laws reported that a copy of the Constitution adopted in 1925 with amendments to date and one of the proposed Constitution had been mailed to each member of the Society. Dr. M. L. Chang, chairman, stated that there were some deficiencies which had been overlooked, that

the changes were too numerous to discuss. The phrase "convicted of felony" was objected to. After some discussion, Dr. Phillips moved that the Committee be requested to consult an attorney regarding the legal aspects of the clause and in respect to the advantages and disadvantages of incorporation. Dr. Orenstein added to the motion that the Committee be provided with funds. Seconded by Dr. Sexton. Carried. Dr. Orenstein moved, Dr. Sexton seconded, that the Committee study membership more thoroughly, in regard to admission of military members, health officers and honorary members. Passed.

The discussion on the resolution adopted by the House of Delegates of the A.M.A. regarding the repression of prostitution was continued. After considerable discussion into which Captain Flinter entered, it was moved by Dr. Phillips that the resolution be tabled and that the Territorial Public Health Commissioner be notified to that effect. Seconded by Dr. Wippermann. Passed.

The 214th regular meeting of the Hawaii County Medical Society was called to order on March 20, 1943, at the Elk's Room. The meeting was the president's annual dinner meeting. Twenty members and 16 guests were present. Among the guests were Col. George Baehr, Chief of the Emergency Medical Service of the Office of Civilian Defense of the United States, Dr. H. L. Arnold, Chief of the comparable service in the Territory and Col. S. A. White, Commanding Officer at the Mt. View Hospital.

Dr. Arnold spoke on various aspects of the medical defense program. (1) He was desirous of getting the Society's opinion regarding the advisability of having the OCD store a reserve of liquor for medicinal purposes to be issued on prescription of a physician. (2) He stated that it was deemed necessary to close blood banks operating under the OCD but that a technician would be available for blood-grouping projects and to operate a bank for peace-time needs. (3) He commented on the excellent cooperation between civilian and military authorities on the utilization of facilities and personnel.

Col. Baehr stated that excellent cooperation also existed between the military and civilian authorities on the mainland. He reported that arrangements have been completed with hospitals in the interior whereby the latter would house and give medical care to evacuees of hospitals in coastal cities in the event of casualties in these areas. He then spoke lengthily of the War Civilian Security program which had recently been set up but would be retroactive to December 7, 1941. Such program provided protection for both volunteer and paid personnel in all the branches of the O.C.D. whether in line of duty or during an attack; this protection, he stated, included among other things: (1) hospitalization, (2) medical care, (3) benefits for permanent disability, (4) partial wages during disabled period.

Col. White corroborated the first two speakers on the cooperation between civilian and military medical personnel.

A fairly lengthy discussion then followed on the storage of a reserve of liquor for medicinal purposes. It was moved by Dr. Carter, seconded by Dr. Mizuire, that the Society go on record favoring the storage of a reserve of liquor by the O.C.D. for medicinal purposes to be issued by the prescription of a physician. Passed.

It was the consensus of opinion that the blood bank should be closed except for operation at a minimal pace to supply civilian peace-time needs.

The matter of the incarceration of insane persons in jail was referred without discussion to the Legislative Committee.

The Treasurer's report of a balance of $1,084.94 was read, accepted and ordered placed on file. The Treasurer reported that Kurashige had paid his delinquent dues. It was generally agreed that any action in regard to reinstatement without re-application would conflict with the by-laws.

The annual election took place.

The 215th regular meeting of the Hawaii County Medical Society was called to order on March 31, 1943. Those present were: Drs. C. D. Brown, S. R. Brown, Hata, Keay, Leslie, Orenstein, Patterson, Phillips, Sexton, Tomoguchi, Wippermann, Yoshina, Yuen and M. L. Chang.

The President brought up for discussion Senate Bill No. 92, an act to amend Act 122 of the present laws. In essence, the bill proposed to lower the qualifications for the position of Territorial Commissioner of Public Health so that any licensed doctor of medicine, without training or experience in public health work, would be eligible. The president stated that he had received reports that the Territorial Board of Health and the Territorial Medical Association had voiced disapproval of the proposed amendment.

After considerable discussion, it was moved by Dr. Keay, seconded by Dr. Phillips that the Society be unalterably opposed to the lowering of qualifications for the position of Territorial Commissioner of Public Health, as proposed by Senate Bill No. 92. Unanimously passed. Dr. Orenstein moved that the secretary send special delivery air-mail letters to that effect to Gov. Stainback, Lt. General Emmons, Dr. M. F. Haralson, Secretary of the Territorial Medical

Association, secretaries of the three other county medical societies, and to each and every member of the legislature. Seconded by Dr. Patterson and passed unanimously.

In respect to legislation on the whole, it was brought out by several members that the Territorial Medical Association and its representatives, the legislative Committee, have repeatedly in years past failed to notify this Society of legislative measures introduced at the legislature, have failed to notify this Society of its attitude and action in regard to legislative measures which concerned the welfare of this society and medicine in general. There was general emphatic agreement on this point. Dr. Orenstein moved, Dr. Phillips seconded, that the Delegates of this Society be instructed at the next annual meeting of the Territorial Medical Association to inform that body that its Legislative Committee shall henceforth inform its component societies of any pending legislation. Carried unanimously.

Dr. Orenstein brought up for discussion the new ruling of the local Board of Health providing that all laboratory specimens be sent to the out-of-town laboratory rather than to the centrally located main office. It was felt that this was creating unnecessary inconvenience. Dr. Orenstein moved that the Secretary be instructed to write to Capt. Flinter requesting that the former method of sending specimens to the main office be reinstated. Seconded by Dr. Yuen. Carried.

The 216th regular meeting was called to order at 4:15 p.m. on April 20, 1943, at the staff room of the Hilo Memorial Hospital by the President, Dr. L. L. Sexton. Seventeen members and three guests were present.

The minutes of the last meeting were read and approved.

Dr. I. Larsen presented two interesting case reports of "Blood Dyscrasias Occurring During Antileutic Therapy." Discussion by Major Wadsworth and Major Spitz. The importance of routine blood studies in these cases was stressed by all speakers.

Letter was read announcing the annual meeting of the Territorial Medical Association on May 21, without scientific session, and delegates Crawford and Patterson stated their intention to attend.

Dr. Patterson stated that several of the Mountain View Hospital medical personnel desired to become service members of the society. This was referred to the By-Laws Committee.

The Library Committee reported that forms had been mailed out to individual members requesting information on medical journals. Dr. Crawford, chairman, reported that binding of the journals was progressing satisfactorily.

Dr. Orenstein, chief of the Emergency Medical Service, reported that he had received a favorable reply from Dr. Arnold to his suggestion that a nurse be sent to Honolulu to be trained in the Kenny treatment of poliomyelitis, in view of the recent increase in this disease. After considerable discussion it was voted that the O.C.D. send a nurse to Honolulu and that the selection be left in the hands of a committee composed of Dr. Orenstein, the President and the Secretary.

Letter from Dr. Enright was read in reply to the Society's request that the Board of Health furnish pertussis vaccine to private physicians for use on indigent patients. This stated that "there is no objection to government physicians to use part of their allotment for the purchase of pertussis vaccine" and that "we do not recommend the general introduction of pertussis immunization by the Board of Health."

Dr. Orenstein brought out the fact that while funds were available for obstetrical care in families of military personnel, no such funds were available on this island. Dr. Orenstein was appointed to investigate this matter.

Meeting adjourned at 6:15 p.m.

M. LEON CHANG, M. D.
Secretary

MAUI COUNTY MEDICAL SOCIETY

The regular meeting of the Maui County Medical Society was held at the Wailuku Hotel on April 11, 1943. (Luncheon Meeting).

Dr. K. Izumi presided; present were Drs. Dunn, Osmers, Shimokawa, H. Izumi, Balfour, McArthur, von Asch, Kanda and Patterson; guests: Colonel Bryant, Major Shupe, Major Wilbar, Captain Lamberson and Captain Boyer.

The minutes of the February 7 meeting were read and approved.

The minutes of the Councilors' meeting held February 18 were read and discussed.

Dr. McArthur reported that the Index Medicus for the past two years and other journals received from the Honolulu Library had been placed in the Maui County Free Library and were available for general use.

The act passed by the Legislature concerning the reorganization of the Board of Health was dis-

cussed. It was voted that the society go on record as opposed to lowering the qualifications of the Territorial Commissioner of Public Health and the secretary was instructed to notify the Legislative Committee of the Territorial Association of this action.

Letter was read from the Board of Health regarding medical inspection and certification of prostitutes. As there are no prostitutes on Maui operating as such, no action was taken.

Dr. Dunn proposed that in recognition of more than 30 years of service, the society make Dr. F. A. St. Sure, Sr. an honorary member. Carried unanimously. Dr. St. Sure began practice in the territory in 1904 and has now retired from active practice.

Since the start of the war the activities of the society have been limited to the society's business and to helping the medical organization of civilian defense. At our last meeting it was decided to call upon some of the excellent talent among the Army Specialists as guest speakers. Dr. McArthur was asked to arrange a program. Colonel Bryant and his staff of the 22nd Station Hospital prepared an excellent program including a lecture by Colonel Bryant and four clinical cases, as follows: laceration wounds; perforating wound with wounds of entrance and exist, and penetrating or lodging wounds in which the bullet remains buried in the tissue, were discussed; their first aid treatment, hospital care and surgery.

W. B. PATTERSON, M.D.
Secretary

HONOLULU COUNTY MEDICAL SOCIETY

A summary of activities of the Board of Governors and membership meetings from January 8 through May 7, excluding the annual meeting, which is reported separately.

Response from the membership to the U. S. Life Insurance Company group insurance plan for doctors was 35 (16%) not interested; 100 (60%) no reply; 65 (32%) interested. The list of interested doctors was turned over to the insurance agent to work up the 75 per cent participation required by the insurance company.

The problem of providing care for elderly people whom the hospitals cannot accomodate was discussed. Dr. Lee reported that this matter had been under discussion by the Board of Health and other agencies and was tabled until after the war. Dr. Benyas was appointed chairman of a committee to study this problem, and the committee subsequently circulated a questionnaire to the membership, the results of which are being studied.

The Board of Health proposed that the medical society adopt a resolution in regard to prostitution, stating: "Since the records of this office indicate that the professional prostitute is the source of about 75 per cent of venereal disease infections occuring in the Territory, which constitutes a serious problem for the armed forces and the civilian population, any method whereby the incidence of venereal diseases may be lessened obviously will be a contribution to the war effort . . . It it believed that the adoption of a resolution similar to the one which is included by the several local medical societies would be of assistance to the Board of Health in controlling venereal diseases in the Territory:

> **WHEREAS, published reports indicate an increasing prevalence of venereal disease in the armed forces and defense workers of this nation;**
>
> **'WHEREAS, commercialized prostitution constitutes an outstanding factor in the dissemination of these diseases and requires an intensified campaign against their elimination; therefore be it**
>
> **RESOLVED, That the House of Delegates of the American Medical Association takes the following stand: (1) that the control of venereal disease requires elimination of commercialized prostitution; (2) that medical inspection of prostitutes is untrustworthy and inefficient, gives a false sense of security and fails to prevent the spread of infection, and (3) that prostitution is unlawful, and physicians who knowingly examine prostitutes for the purpose of providing them with medical certificates to be used in soliciting are participating in an illegal activity and are violating the principles of accepted professional ethics.**

The Board of Governors felt that until the military authorities present a clear-cut attitude on the question of prostitution, it was no the business of the medical society to take any action.

Dr. Walker reported for the Library Committee that although there is a theoretical balance available to the committee, actually the County Society would go into the red if that balance were spent. The $1,500 yearly appropriation for library purposes is considered insufficient and the committee asks that for next year this be increased. To meet this, it was suggested that the dues be increased. The suggestion that the Committee try to raise funds in the community was not favored. A motion to increase the dues $10. was tabled and it was felt that such a recommendation be considered after the Society's books are closed for the year and a budget for the Library drawn up.

On receipt of a communication from Dr. Arnold Sr. of the OCD regarding the effects upon hospitals, medical and nursing professions of the restoration of civil functions, a special committee of the Society called upon the Governor.

Dr. Arnold Sr. proposed to make available a certain quantity of liquor against prescription by physicians. In view of previous unpleasantnesses in

the prescription of liquor, it was decided to advise Dr. Arnold that the physicians did not wish permission to prescribe liquor but proposed that machinery be set up so that small quantities will be available for individual patients upon the personal request of physicians.

Letter received from General Emmons, dated February 7, 1943, commending the Society for its work on the December 7 was ordered photographed and framed.

At the May 7 meeting Dr. Arnold Sr. presented an agenda for discussion which was acted upon as follows:

"Malpractice insurance for Army medical officers on duty in civilian hospitals. The Board agreed that these officers be recognized to obtain malpractice insurance on the same basis as civilian physicians, upon becoming members of the Society. The service membership of $5.00 per year would make them qualify.

"The Board was of the opinion that surgical practice in O.C.D. hospitals should be limited to those men authorized by the American Hospital Association.

"The Board felt that the Poliomyelitis Hospital should be operated by a closed staff for the present, and that this staff should receive remuneration for the care of indigent patients.

"The matter of discontinuing the use of private duty nurses except upon decision of the hospital nursing staff and a board of physicians was tabled for further study.

"The Board was in accord with the suggestion that physicians use the less bulky drugs wherever possible.

"The Board will petition the Governor to persuade the War Department to permit the retention of Army doctors now serving as residents at St. Francis, Leahi and Kapiolani Hospitals."

Senate Bill No. 159, relating to the Department of Public Welfare, extending benefits to the furnishing of medical care, hospitalization, etc., was discussed, and it was decided to ask the Governor to allow representation of the medical society in advisory capacity in the drawing up of procedures for the execution of this bill. Drs. Mossman, Winter and Smith were appointed a committee to attend to this.

The Society received a Resolution from the Senate proclaiming and recording the outstanding service by the Honolulu County Medical Society and the physicians and surgeons volunteering for service on December 7th, 1941 in the care of the wounded of the armed forces.

On April 22, 1943, the members of the society were guests of Captain McMullin and his medical officers at the U. S. Naval Hospital, Aiea Heights. A tour of the hospital was made at 3:00 p.m. and a buffet supper served. Papers were presented as follows:

Cysts and Fistulae of the Neck
Lt. Comdr. Frank H. Wanamaker

Wood Alcohol Poisoning
Lt. Comdr. Walter L. Voegtlin

Experimental Immersion Blast Injuries
Lt. Morris T. Friedell

The Role of Intramuscular Pressure in Shock
Lt. Comdr. Lewis Gunther

—O—

ANNUAL MEETING

The annual meeting of the Honolulu County Medical Society was held on Friday, April 2, 1943, at 8:00 p.m. in the Mabel Smyth Auditorium following a buffet supper given by the outgoing President, Dr. Fred K. Lam. Sixty-three members were present. Reports of officers and committees were heard.

The following were elected to office:

President:	N. M. Benyas
Vice-President:	H. H. Walker
Corres. Secretary:	F. J. Halford
Recording Secretary:	R. L. Hill
Treasurer:	H. E. Bowles
Board of Governors:	R. O. Brown Richard Lee William Winter
Alternates Board of Governors:	Jesse Smith Harry L. Arnold, Jr. H. M. Johnson
Board of Censors:	V. E. M. Osorio
Committee on Forms Medical Practice:	Fred K. Lam
Delegates to Hawaii Terr. Med. Ass'n.:	A. G. Schnack Arthur Davis Maurice Gordon Edmund Ing Frank Spencer
Alternates for Delegates:	H. S. Dickson P. S. Irwin William Wynn D. C. Marshall James Kuninobu H. Q. Pang
Hawaii Med. Service Association:	F. J. Pinkerton L. G. Phillips Richard Sia

The Secretary reported a total of all classes of membership as 249. Of these, 16 are honorary members, 14 service members and 19 are members in full-time military service.

Workmen's Compensation Committee (Dr. Pinkerton, Chairman) reported eight meetings throughout the year, several of them with insurance representatives to promote a wider choice of physicians in the expanding industrial case loads, and to discuss alterations, amendments and amplification of the Workmen's Compensation Fee Schedule. The insurance men were willing to entertain the society's proposals for change, and the committee has done considerable work on this revision since. Physicians in the specialties were invited to submit suggestions for revision; these have been assembled and coordinated and are awaiting final review by the committee. In general the changes being considered constitute: (1) amplification and a more comprehensive itemization to include listings not now included; definitions and listings of new procedures that have come by practice to be considered industrial accident items; (2) A definite increase in certain items due to increased medical salaries, care, rent, drugs and general expenses; and (3) a definite reduction for certain fees which in the past have been too high.

A sub-committee heard several controversial cases between doctors and insurance companies and rendered reports promptly with apparent satisfaction to all parties concerned.

In June, meetings were held with Hawaiian Constructors-U.S. Engineers in an effort to arrange an agreeable medical care fee schedule for their contract employees. It seemed our efforts to bring these employees under the H.M.S.A. plan were about to materialize, but a change of authority took place and these employees were put under military medical care.

Resolutions Committee (Dr. Batten, Chairman) reported two resolutions adopted recording the death of Dr. Charles R. McLean and Dr. Harry T. Hollman.

Committee on Forms of Medical Practice (Dr. Doolittle, Chairman) reported one meeting during the year to consider the current local practice of examination and treatment of firemen. No complaints of irregular contract practice were brought to the committee. Members of the committee participated actively in the consideration for revision of the Workmen's Compensation Fee Schedule and in efforts to benefit the health of war workers in Hawaii. The committee closed its report with a note of caution: "It is suggested that all members of the local Society interest themselves in the programs of so-called socialized medicine. Great Britain is laying plans for spread of government controlled sickness insurance which may have far-reaching effects in that country and in ours. Labor organizations in our own country and many high-ranking government officials are planning spread of a similar program in our country. We should be 'in the know' and probably our best protection against objectionable programs is to lend a sympathetic ear and to attempt to guide such effort in its inception and growth. The Medical Service Association is a partial answer to this problem. Work of that Association should be better understood by all members of the society. Your full cooperation in the organization's program is urged."

The Reception Committee (Dr. Dougan, Chairman) reported as follows:

> "No formal meeting of the Reception Committee was held during the year owing to the exgencies of war. Individual members have, with the hearty assistance of the other members, endeavored to work and otherwise see that visiting physicians, particularly those in the service became acquainted with local doctors in the same specialties or with common interests.
>
> "The practice of introducing new physicians at the medical meetings has received favorable comment.
>
> "The committee feels however that much more may be done by way of increasing attendance and membership as the restrictions imposed by the necessities of war are removed."

The Medical Milk Commission (Dr. Winter, Chairman) reported as follows:

> "During the year there were nine regular meetings and three special meetings.
>
> "Early in the year it was realized that because of an ever-increasing labor shortage as a result of the war, the production of Certified milk, in Honolulu, and for that matter all fresh milk, might come to an end. This possibility was brought to the attention of the Military Governor, and representation from the Milk Commission, as well as those from other sources, were instrumental at least in part in bringing about a "freeze" of labor in the dairy industry. Labor was frozen in a general way to the industry and not in a specific manner to the individual dairies themselves, with the result that a man might leave any dairy at will, but he could not leave the milk-producing industry at large and seek occupation in some other field. This has probably helped to maintain the supply of fresh milk in the city—which supply is already many times smaller than the evergrowing demand.

"Salaries for the entire paid staff were raised substantially during the year and one new paid worker was added to the staff. The general cost of operating the Commission's laboratory rose appreciably. In the face of this it was necessary to increase the basic monthly assessment to the certified dairies fifty percent on the first hundred cows.

"The maintenance of standards was difficult throughout the year and the Commission has been somewhat liberal with the dairies in this respect, bearing in mind always the difficulties under which they are now operating. During the year a sincere effort was made by all concerned to maintain the standard of certified milk, but this high aim under present conditions is not always possible.

"Because of this the Milk Commission has been generous but in this respect it can not afford to be generous to a fault. After due consideration and general discussion it is the unanimous opinion of the Commission that for the duration of the war *all* milk produced within the City and County of Honolulu should be pasteurized.

"If, as a general precautionary safeguard, it was thought wise to protect the city's water supply by chlorinating it, is it not equally logical to protect the milk supply of the city by pasteurizing it? The Commission believes that it is, and makes this recommendaton to the Honolulu County Medical Society, leaving to the parent body whatever action it may deem advisable."

The Preparedness Committee's report (Dr. Arnold, Chairman) is omitted here and appears instead in the Emergency Medical Service section of this issue since it is of such general interest also to the members on the outside islands.

The War Workers Committee, a special committee appointed late in the year, headed by Dr. Withington, to deal with the problems which have arisen concerning the health and medical services for defense workers, had one very satisfactory meeting with representatives of the Army and Navy, and it is expected that this work will be carried on.

The Library Committee (Dr. Walker, Chairman) reported:

During the year four meetings of the Library Committee were held at which times routine operational matters were reviewed, minor changes in policy adopted, new book and journal acquisition studied and authorized, and discussions held relative to future plans for the growth of the Library.

A great many hours of work have been devoted by Mrs. Bolles and her assistant to the multitude of details necessary to promote the organization, operation and growth of our library. The expert services of Mrs. William Shanahan in a consulting capacity have been of inestimable value in establishing and developing the present system of index and classification, and otherwise in advising on technical matters. The Society is deeply indebted to these individuals for their unflagging efforts in building the library to what it is today.

Our outstanding acquisition of the year was the major portion of the library of the Kalihi Receiving Station which, thanks to the kind offices of Dr. Linson, was obtained on an extended loan basis. This collection, consisting largely of bound volumes of numerous journals extending back over many years, greatly enhances the value of our reference library.

Operating expenditures for the year will total approximately $1,850, of which $350 is allotted for new book purchases authorized but not as yet acquired.

Attached is the budget for the ensuing year, as approved by the Committee and recommended for adoption. The total budget calls for $2,786, of which $986 is for current overhead expenses, and $1,800 for proposed additional expenditures, including the purchase of new books and journals ($600), bookbinding ($800), fees for consultant librarian service ($200), and miscellaneous supplies and equipment ($200).

In submitting this budget, which exceeds previous yearly expenditures, it is the desire of the Committee to bring to the attention of the Society that the library cannot continue to function effectively on the budget hitherto allotted, and that the proposed budget represents a most modest expenditure for the privilege of possessing an adequate medical reference library in Hawaii.

The membership approved a budget of $3,000 for this committee.

N. M. BENYAS, M.D.
Secretary

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